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IDE TO IBM PERSONAL COMPUTERS

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Volume 4 Number 18

\$2.95

September 3, 1985

- The Latest Software
- Exotic Hardware
- Electronic Mail

# Corporate Communications

## Making Better Connections

IN  
"POWER  
USER": dBASE  
DOS INTERFACE

**Special Report on  
The PC Office:  
Designs That Work**

**R:BASE 5000,  
The New Dean  
Of Databases?**



Introducing  
the new  
standard  
in tape  
backup  
systems.



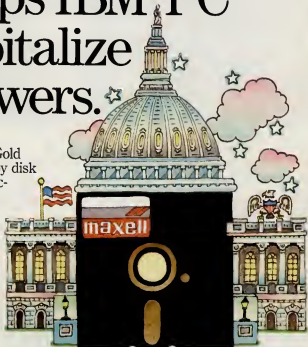


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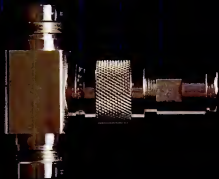
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**Crosstalk Mark 4 and Access:  
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**Good Things Come in Black Boxes** ..... 124

Winn L. Rosch/When no amount of coaxing will make your PC communicate the way you want it to, add-on hardware solutions from Black Box may be just what you need.

**The Smartest Modems of Them All** ..... 130

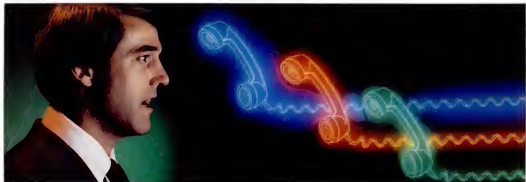
M. David Stone/Features and flexibility are the payoffs of these 2,400-bps mainframe modems. But, in return for more power, you may have to endure a few inconveniences.

**E-Mail for the Well-Connected Office** ..... 137

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Barbara Krasnoff/*PC Magazine* evaluates The Big Three of electronic mail—MCI Mail, EasyLink, and ECHO—as well as software that can expedite your use of each service.



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#### Grand Designs on the One-Computer Work Space ..... 161

*Howard Rheingold*/The desk's basic design has remained unaltered since its inception. Recently, however, the lowly desk has followed the computer that sits upon it into today's high-tech world. Now known as a workstation, it is a new focus of architects and designers, who are redefining the relationship between workers and their desks.

#### Designing Your Personal Computer Space ..... 169

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Here's a nationwide listing of companies you can call to find ergonomically designed PC furniture.

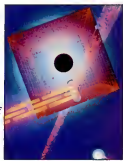
#### Designing Tomorrow's Office ..... 181

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#### The World According to Zim ..... 194

*John Helliwell*/All database management systems operate in basically similar ways, right? Wrong. The Zim database system breaks from the database norm and uses a complicated new entity-relationship approach to make difficult retrieval chores quick and simple.

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AT\* and compatibles.

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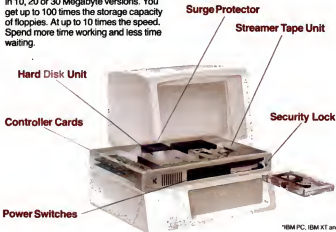
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PC PAINT



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The Edge



The Plain Facts:

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• IBM Monochrome Compatible, 720x348, High Resolution	✓	✓	✓	✓	✓	✓
• Runs Lotus 1-2-3™ and Symphony™ in high resolution monochrome	✓	✓	✓	✓	✓	✓
—132 columnsx25 rows	✓	✓	✓	✓	✓	✓
—132 columnsx44 rows	✓	✓	✓	✓	✓	✓
• PC Paintbrush in monochrome	✓	✓	✓	✓	✓	✓
• 16 shades of green on the IBM monochrome monitor	✓	✓	✓	✓	✓	✓
• Runs color software on the IBM monochrome monitor, full screen:	✓	✓	✓	✓	✓	✓
—Flight Simulator	✓	✓	✓	✓	✓	✓
—PC Paintbrush	✓	✓	✓	✓	✓	✓
—PC Paint	✓	✓	✓	✓	✓	✓
—PC Tutor	✓	✓	✓	✓	✓	✓
—Pinball	✓	✓	✓	✓	✓	✓
—Without software patch needed	✓	✓	✓	✓	✓	✓
• Automatic Boot-up without software patch needed	✓	✓	✓	✓	✓	✓
• Runs Lotus 1-2-3™ and Symphony™ in high resolution color:	✓	✓	✓	✓	✓	✓
—16 colors, 320x200	✓	✓	✓	✓	✓	✓
—4 colors, 640x200	✓	✓	✓	✓	✓	✓
• Printer port (standard)	✓	✓	✓	✓	✓	✓
• Software switchable among color, monochrome and 132 columns mode	✓	✓	✓	✓	✓	✓
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## IBM Planning Assistant

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recast		
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3,500		3,677
9,000		9,032
5,000		4,702
16,000		16,086

IBM

## IBM Reporting Assistant

IBM



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# Two

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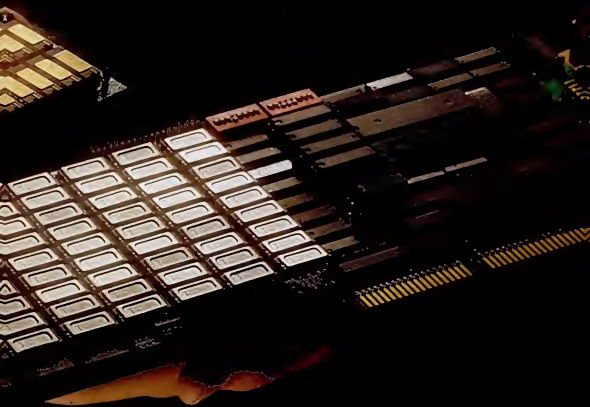
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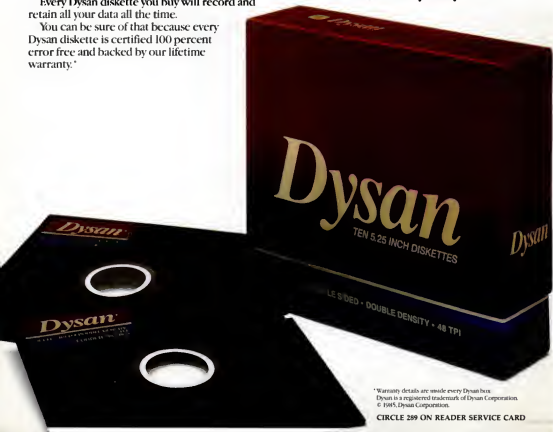
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# What's Inside

A few dedicated writers worked into the wee hours testing communications options for this issue's cover stories, while an associate editor scoured the nation looking for workstation efficiency.

No one can argue that the speed and efficiency of a company's communications system has become vital to corporate health. A quick, well-organized and well-presented message gets you in before the competition and can make the difference with image-conscious clients. An electronically transmitted message not only gets there immediately but also shows that you're on top of the technological revolution.

In this issue's cover stories we give you the full story on today's microcomputer communications options. The market is being saturated with a windfall of new hard and soft communications technologies from high-speed modems and interoffice minicomputer networks to public electronic mail and bulletin board on-line systems.

In fact, Frank Derfler, who reviewed two new communications packages from Microstuf and Microsoft, says he was introduced to more excitement in the field of communications software in 30 days than he has seen for years. "This is the most fun I've had since I began doing software reviews about 10 years ago," Derfler explains. "Access and Crosstalk Mark 4 are new-generation programs, and they are setting a new pace."

Apparently, Derfler sat contentedly in front of his PC at 2 a.m. testing the software, trying to talk to three different computers at one time using three different on-screen windows. "I had the capability to talk to 15 computers at the same time," Derfler chuckles. "I haven't figured out why you'd want to, but the capability is there."



Frank Derfler wasn't the only writer who put in late hours for this issue. M. David Stone kept his neighbors up until 3 a.m. while he repeatedly called himself to test three new 2400-baud modems: the Concord Data Systems CDS Autodial, the Racal-Vadic 2400PA, and the AT&T Dataphone 2224BD.

Winn Rosch dug up the facts on various communications hardware products offered by the Black Box Corporation, which supplies a multitude of hard answers to, well, hard problems. "They offer alternate solutions to communications problems," Winn explains. "These are products that eliminate having to struggle with software every time there's a problem. Usually, you can fix a problem with software, but it can take a lot of time and effort, and then the software sometimes does things to your com-

puter that have to be altered . . . This way, you can just plug in a piece of hardware, and the problem's solved."

## Better Than Home-Run Systems

While all our authors were more than happy to share their experiences here, associate editor Barbara Krasnoff was too busy polishing her story on public electronic mail systems to lend her comments. More professional than home-run bulletin boards and more publicly accessible than private networks, these e-mail systems are slowly beginning to threaten the U.S. Postal Service (and everyone knows how much we'd miss it). Krasnoff turned her routine assignment of testing MCI Mail, EasyLink, and ECHO e-mail systems into fun by sending cryptic message to colleagues.

While Krasnoff was hunched over her modem here in New York, associate editor Jennifer de Jong was flying around the country looking for the ideal microcomputer work space on behalf of this issue's special report on optimizing efficiency (not to mention aesthetic pleasure) at a microcomputer workstation. The resulting examination of the top three workstations, written by author Howard Rheingold, is a fascinating and well-illustrated look at how some top companies have solved their work space design problems.

Rounding out this report is Dara Pearlman's article on how to design your own personal computer work space and a speculative piece by Jane Wollman on tomorrow's office. Also in this issue Alfred Poor takes a long, hard look at

## WHAT'S INSIDE

*R:BASE 5000*, a revision of Microrim's popular database *R:BASE 4000*. You may recall that when Poor gave us a sneak preview of *5000* in the July 9 issue, he admitted that he had not been a fan of

the earlier version. Improvements to the package seem to have won him over, however. He reports that *R:BASE 5000* has "more standard features than a Japanese sports car."

### Power User

Just the other day assistant editor Dave Obregon dropped by, enthusiastic about a program that appears in *Power User*. (Obregon, incidentally, is the man behind *New on the Market*, popularly known around *PC Magazine's* office as NOTM, pronounced "nah-tem.") This issue's column features a new *dBASE-DOS* interface program that allows you to access any application from within *dBASE* rather than having to go through the rather tedious process of quitting the program. (Those of you who don't feel like keying in the entire program can, of

DO YOU FEEL ALL ALONE  
OUT THERE WHEN IT'S TIME  
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## STARBRIDGE™ DOS

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course, find it on *PC Magazine's* bulletin board, otherwise known as the PC Interactive Reader Service, by calling (212) 696-0360.)

John Helliwell takes a look at *Zim*, a new database management system that has a unique method of viewing data. Many database systems can manipulate more than one file at a time, but *Zim* is different in that it permits you to establish links between three or four or even more interrelated databases. *Zim* is the first commercial software product to use an "entity-relationship" model of data, which more closely resembles the way that information is related in real life.

In the Programming column, Steve Holzner discusses how to protect your data with a short, easy utility called Lock. Lock encrypts your data by mixing up bits taken from different parts of the file. Unless you give the password, the file will appear on the screen as nonsense. At PC, where a snoopy disposition prevails, this utility could prove to be extremely popular. ■

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DATABASE THAT'S UNABLE TO  
KEEP PACE WITH OUR  
**GROWING COMPANY**, YOU'LL  
HAVE TO CHANGE YOUR NAME  
AND MOVE TO PARAGUAY!



# **"Revelation" is a classic case of 'you get what you pay for.' It costs a bit more than most, but it gives you the best there is."**

*PC Magazine*  
September 4, 1984

If you think that dBase III™ or R:base 5000™ is the solution to your information processing needs, consider for a moment the high expectations you and your company should have for your next database management system.

## **For starters, it needs to network.**

Your PC's may not be talking to one another today. But they will soon. With Network Revelation you decide when and how. That's because our network software is available now, not "someday soon." And it works with a variety of microcomputer networks.

You choose the best technology for your unique needs. Including hardware by IBM® Novell and Nestar. And PC-DOS 3.1 or Novell NetWare™ operating systems.

## **Make sure the DBMS locks records. If it doesn't, your data is in danger.**

Network Revelation locks data at the record level instead of restricting access to entire files. If this seems like a trivial feat, you'll be surprised to know that Revelation is one of the few network database systems that work this way.

With most others, record management is a free-for-all. One person opens a file and locks everyone else out. Or multiple users can simultaneously change data. Hardly the makings of a DBMS for critical record keeping.

## **If the database can talk to mainframes and minis, you've just written your ticket to a complete distributed processing system.**

Revelation isn't about to be confined by the limits of MS-DOS™. For advanced programmers, we include tools to access the world of mainframes and minis.

Imagine, the knowledge of a mainframe in everyone's PC. With Revelation you have an interactive distributed information system that shares both data and processing power. With complete password security, of course.

## **Be sure that the application generator has an excellent command of the language.**

R/Design, Revelation's application development system, does more than paint screens and define



relations. It's so powerful your programmers can bid farewell to COBOL forever. And save weeks of coding time on new projects.

That's because R/Design writes programs in R/Basic source code for you. And R/Basic is the most powerful relational database language running on PC's.

## **Find out how easy it is to retrieve information. Ask the DBMS a few pointed questions.**

If you're thinking that Revelation's capabilities make it too sophisticated for the computer neophytes in your company, fortunately, you're wrong.

R/List, Revelation's query language, uses common English words. And unlike other so-called "natural language" programs, you can do far more than define synonyms for system commands and file names.

Words you create can actually call R/Basic programs. A simple inquiry will perform complex calculations, build symbolic fields and write detailed reports.

## **To be successful, you need the best database there is.**

That means superior technology with its roots in mainframes and minis. A system so powerful it delivers on every challenge you throw at it.

Network Revelation has it all: variable length fields to conserve precious disk space; unlimited files, fields and records; data dictionaries; dBase II® and Lotus 1-2-3™ conversion utilities; a high-speed compiler; an interactive program debugger; and prices that begin at just \$1495 for a complete four user system (suggested U.S. list price).

## **You won't be the first to buy Network Revelation.**

Alert companies like Ford Aerospace, First Interstate Mortgage, Rolls Royce, Price-Waterhouse and Rockwell have already discovered why *PC Magazine* called Revelation "the most comprehensive and powerful database management system available today."

## **You'll see the difference too when you turn the page...**



HOWEVER, IF YOU FIND ONE  
THAT CAN GROW AS WE GROW,  
**EVEN NETWORK**, YOU JUST  
MIGHT BE OUR NEXT  
VICE PRESIDENT!

WHY ARE YOU SMILING?

NETWORK  
REVELATION!



# A revealing point by point comparison between Revelation, R: base 5000 and dBase III

	Network Revelation	R:base 5000	dBase III
Maximum Characters per Record	65000	1530	4000
Maximum Fields per Record	65000	400	128
Maximum Files per Database	Unlimited	40	Unlimited
Maximum Files in Use Concurrently	6000	3	15
Number of Relational Operators	9	6	6
Data Dictionary	Yes	Yes	No
Procedural Language	Yes	Yes	Yes
Variable-Length Fields	Yes	No	No
Multi-Value Fields	Yes	No	No
Symbolic Fields	Yes	No	No
Dynamic Joins (in RAM)	Yes	No	No
8087/80287 Support	Yes	No	No
Automatic Key Index Maintenance	Yes	Yes	Yes
Multiple Field Indexing	Yes	No	Yes
Report Writing Features:			
A) Access to System Date and Time	Yes	Yes	No
B) Choice of Column or Row Format	Yes	Yes	No
C) Accessible Tables	6000	40	10
Password Security	Yes	Yes	No
User-Definable Data Entry Rules	Yes	Yes	No
Context Sensitive Help	Yes	No	No
Pre-Defined Macros	Yes	Yes	Yes
Utilities to Access Program Files From: <sup>1)</sup>	dBase II Lotus 1-2-3	dBase II, Lotus 1-2-3 pfs:file, R:base 4000	dBase II
Access to All DOS Commands	Yes	No	No
Application Generator	Yes	Yes	No
Application Compiler <sup>1)</sup>	Yes	Yes	No
Run-Time Module <sup>1)</sup>	Yes	Yes <sup>2)</sup>	Yes <sup>2)</sup>
Natural Language	Yes	Yes <sup>3)</sup>	No
Network Version	Yes	No <sup>4)</sup>	No
Mainframe to Micro Communications <sup>1)</sup>	Yes	No	No

1) From Original Manufacturer; 2) Available Soon; 3) Extra Cost Option; 4) Announced for Fall 1985

dBase II is a registered trademark and dBase III is a trademark of Ashton-Tate. R:base 5000 is a trademark of MicroRM, Inc. MS is a trademark of Microsoft. IBM is a registered trademark of International Business Machines Corporation. NetWare is a trademark of Novell, Inc.

**I think Network Revelation is going to get me promoted and keep me from being transferred to Paraguay.**

☐ I'd like to see an in-person demonstration of Network Revelation here, in my office. Please call me at this number ( ) \_\_\_\_\_ to arrange a convenient time. The best time to call is \_\_\_\_\_.

- ☐ I hear Paraguay isn't a bad place to visit this time of year. But just in case, send me a brochure and technical specifications on Revelation.
- ☐ My flight to Paraguay is already booked. RUSH me a copy of the new Revelation Introductory Tutorial Booklet for \$24.95 plus \$5.00 shipping and handling (includes free demo disk with sample application.)

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Circle 218 for more information.

# TAPE IT EASY.

**B**oy, are you in for a surprise. You know you need mass storage. And you know you need some kind of backup.

But what you don't know is that making a backup from your hard disk can take the patience of a saint. And tax the memory of an elephant.

Unless, of course, you have a little TLC. The new TrimLine Combo from Corvus. You get mass storage (20 Mbytes). The incredible speed and efficiency of a hard disk. And an integral tape backup.

But there the similarity between a Corvus and anything else ends.

First of all, your TLC fits in beautifully. Between your IBM PC's monitor and base. No bulky boxes. And no clumsy cables and wires to trip over.

Next, you get the world's easiest tape

backup system. If you like using command lines, fine. The TLC will accommodate you. But if you're more interested in simplicity, just use one of the TLC's menus. And one of your fingers.

You can back up the entire disk. All your data for the day. A group of selected files. Or just one single file. As a matter of fact, you can back up whatever you want. Which will save you quite a bit of time and aggravation.

You'll also find backed up files in seconds with the TLC's Directory. No more searching an entire tape just to find one file.

Finally, you'll enjoy the backup speed of the TLC. There's no formatting of blank tapes (which can save you about two hours). And no worry about losing data to bad sectors the format has called good.

Scared? Don't be. Just tape it easy. Check out the TrimLine Combo from Corvus.

In addition to all the features, it's one of the lowest-priced tape backup systems you can find.

For more information and the name of your nearest Corvus TLC dealer, call (800-4-CORVUS).



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Advanced technology saves us space and saves you slots. Thanks to state-of-the-art custom VLSI circuitry, we were able to shrink the size of our color and monochrome display adapters. This gave us the space to put all the functions your PC needs onto one circuit board.

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#### General Ledger

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- 3 Year account history for CRT inquiry
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- CRT transaction inquiry, unlimited journals
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#### Accounts Receivable

- Opens invoice or balance forward
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- Automatic invoice charges
- Supports partial payments
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- Automatic sales forecasting by customer, salesperson or customer type

#### Accounts Payable

- Check printing and up to 10 invoices paid per check
- Automatic allocation of available cash to payables
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- Aging reports with 7 customized columns
- Unlimited # of vendors
- Mailing labels with 4 different sorts
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- Supports average, last purchase, and standard costing methods
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# NUMBER SMASHER

**Speeds Up Everything...Especially 1-2-3™!**

The MicroWay NUMBER SMASHER triples the speed of all CPU bound software while doubling the speed of 8087 bound software. When combined with MicroWay's FASTBREAK™ it results in an increase in the speed of 1-2-3™ of up to 11! If you're tired of WAITing, the SMASHER is the card for you!

The heart of the NUMBER SMASHER is a 9.54 mhz 8086 working with a matched high speed 8087. The card comes standard with 512K of 16 bit RAM and can be expanded to 640K. It triples the throughput of your original 8088 by doubling the system clock speed and quadrupling the data bus bandwidth.

Software compatibility is guaranteed by the nature of our card. It does not augment the 8088, but replaces it with a special 8086 that runs as a true 16-bit processor in the first 640K of ram and as an 8-bit processor everywhere else.

Examples of software which show dramatic speed-ups include AUTOCAD, 1-2-3™ worksheets which depend heavily on financial or transcendental functions, and multi-user operating systems. Any program written with an MS-DOS compiler that supports the 8087, such as MS-FORTRAN or 87BASIC, will run on the NUMBER SMASHER at least a factor of 2.5 times faster! Software that comes with the card also increases the throughput of I/O bound programs and includes a disk cache routine, ram disk and print spooler.

The NUMBER SMASHER is an upgrade product for 8088 based PCs and compatibles. It works on the IBM-PC and XT, the COMPAQ and compatibles manufactured to the IBM-PC hardware standard. Contact MicroWay or your local MicroWay Installation Center for technical specifications and supporting benchmarks.

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dAssets	Asset/Depreciation	\$195
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\*Compiled versions are also available. dBASE III and dBASE II are registered Trademarks of Ashton-Tate, Inc. Copyright 1985, SBT Corporation.

**CIRCLE 479 ON READER SERVICE CARD**

# IF YOU PROGRAM IN 'C', PC BRA, Our Craftsman™ Line Has New Products,

## C-SPRITE

**Lattice's Own Symbolic Debugger for Lattice® C**

It gives you the best of both worlds for as out of this world price. Hand it a COM or EXE file produced by the Lattice compiler (using the -d option) and C-Sprite™ will speak your language: your function names, your variable names, your data types, and the line numbers from your source code. At the same time you can get a close-up view of machine addresses and machine-coded instructions, if you want to scrutinize just what machinations the compiler (or an assembler) concocted.

You already know how to converse with C-Sprite if you are familiar with Microsoft's Debug. Lattice began with well-known command language, and added to it a considerably. You can work with data in hex, as you might expect, but you can also differentiate between C data types to cause the debugger to treat addresses as strings, long integers, etc., even pointers, both in display and entry.

C-Sprite can set breakpoints using symbols or addresses. You can insert characters that will be executed at the breakpoints, or set commands that execute until a condition is met.

C-Sprite even has macros—use your source code variable names in a macro to dump the contents of entire C structures, for example. And you can debug through one of the COM ports with a second terminal as well as not to disturb your program's display screen. What's more, if you link with Plan9™, C-Sprite can even take overlays.

Program doctors will find plenty of implements to rummage through in this listing.

Product Code:	Lat Price:	Our Price:
L3000	\$175	\$159

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## dBc

**Switch from dBASE's Language to C for Power, Speed**

There are a lot of dBASE™ the users out there. Most of them just keep data bases and use dBASE's limited reporting facilities. They're not programmers, so they don't use the programming language, but they'd like more for their efforts, and that's a business opportunity.

dBc™ links C to dBASE. It is a function library that creates files which exactly replicate dBASE file design. dBc can read and update them. And the reverse, dBc can use any file created by dBASE. Now C and dBASE can operate on the same data bases interchangeably.

That opens up the widespread culture of dBASE: missionaries to exploitation by C programmers. Now you can replace the resident

Two Versions:	Product Code:	Lat Price:	Our Price:
DBase II Compatible:	L001	\$50	\$225
DBase III Compatible:	L011	\$50	\$225
Both:		\$100	\$375

## TEXT TOOLBOX™ #1

**These Utilities Work Wonders of Organization**

Welcome to "grep", "m", "ld" and "ldiff", tools you will reach for as routinely as "copy" once you come to know them. Unix™ boasts a number of marvelous utilities that are migrating to the PC world. Lattice has assembled a cluster of the most useful text management tools into a single package.

"Grep" looks for text patterns in any number of files. Want all occurrences of a global variable throughout a program system? Want to search all programs in a directory, down paths to other directories, or all files on a disk? Need to find all the function calls in an entire program system? Grep can do it with a powerful expression syntax that goes far beyond your text editor's search command, because you can tell it to search all "c" files for all lines with "c" and "j", no matter how many characters lie between the parentheses. In text searches it will match any character in whatever character group you cite, in a single character position or anywhere in a string, as you specify. Or "Grep" will match patterns only at the beginnings or endings of lines, and can differentiate between embedded and isolated strings. "Grep" is a real gem.

"WC" counts lines, words, and characters in a file and has a checksum independent of machine character sets so you can test whether a file has successfully been transferred between computers.

"Ed" is similar to the well-known Unix editor. It offers search and replace with "Grep"-style syntax, block move, read and write, optional line numbering, append, insert, delete, and this unusual facility: you can instruct "Ed" to apply a file of commands to any number of target files, even complicated changes and test additions, such as those created by "Diff".

"Diff" you've probably tried to write one (and then discovered how tangled the logic gets). "Diff" compares text line for line and reports differences. It's much more sophisticated than "Becor". If your MS-DOS has this. It can optionally ignore "white space" differences (blanks, tabs). It uses complex algorithms to re-synchronize between files after discrepancies of any number of lines are found. And its output is a precise list of sections differing what to do to realize two files the same, a list which you can hand to "Ed" to do the job.

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dBc language with the speed of C. And you no longer have to write every line of code, because moving to C switches C will storehouse of off-the-shelf code.

Use dBc for custom work for customers, or design generalized programs for manipulation and reporting of dBASE data bases. Or use it on its own. It's a complete ISAM file manager for use with the Lattice C compiler whether or not you want to deal with the C compiler, but versions for all four memory models, and can have integer index and data files on one disk. dBc is a complete set of ISAM routines (that parallel dBASE commands) which the manual and demonstration source files on the disk.

You'll ultimately find each assistance indispensable. Like having a librarian to sort out the confusion every day and keep your work tidy.

Product Code:	Lat Price:	Our Price:
L2000	\$120	\$105

## CURSES

**A Screen Management Interface to Swear By**

Curses is a Lattice creation which manages the screens of the IBM PC in the same fashion as the curses utility of Unix and similar operating systems. Use it to adapt programs which call Unix curses functions for screen management, and need the equivalent library when moved to the PC for re-compilation. Or use it when creating software on the PC to assure that it is Unix compatible.

Curses is a library of eighty-four functions and macros which can keep any number of screen images in memory. A screen may be full or partial size, and any can be summoned to the physical screen at your program's command.

Within a screen, Curses employs a vast function list to get characters, wrap lines, scroll, blank lines, highlight—virtually any tool needed to update the screen. The product supports color, and all four memory models. Its syntax functions give you control over whether to echo each character to a memory screen. In keeping with the terminal orientation of Unix curses, the physical screen is re-painted (at high speed) only when your program calls a refresh function.

Writing screen management code leads to unrepeatable snafus and expressions. Swear off Curses clean up your language.

Product Code:	Lat Price:	Our Price:
L0800	\$125	\$110

## C CROSS COMPILERS

**Portability to 16-Bit With Cross Compilers From Lattice**

PC BRAND now carries an assortment of cross compilers to move programs from larger host machines to the PC-DOS or MS-DOS environments.

Cross compilers are now available for these hosts: VAX/VMS™, VAX/UNIX, MCR/UNIX, Alter 586, Hewlett-Packard-UX.

Cash in on products already developed on your bigger machines by rapid transfer to the burgeoning world of PC owners. Or take advantage of big machine services and utilities for your development work for the PC market, and only then download the results. A quick mental calculation will convince you that productivity gains will quickly trade off costs.

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Code Sifter finds the sluggish spots in your program. On its own, it will divide a COM or EXE file of any size into thirty-two equal portions. Alternatively, you can specify the partition boundaries with addresses, or with symbols if your linker has produced a symbol map. Then tell Sifter to run your program. It samples your object file at precisely timed intervals and counts how many times it finds the instruction pointer in each partition. Job done, it reports the number and percentage of hits in each partition.

You are in for some surprises when you discover just how uncollected the activity is likely to be, and that's why Code Sifter is so valuable. It profiles just where you can best spend time optimizing your code, or even converting to assembler subroutines.

Code Sifter has a number of monitoring options. You can tell it to include any combination of your program, DOS, and BIOS in its analysis. You can specify the sampling rate. You can tell Code Sifter the number of times to run a program, and between each run discard the less active ranges, and re-partition the hot spots, so that you access the most active areas of code. Right down to the last byte! Try it on the sample program that comes with your disk.

Code Sifter. It will give you the racer's edge.

Product Code:	Lat Price:	Our Price:
N0100	\$119	\$99

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**A Text Editor to Make Your Own**

CVUE is a text screen oriented text editor which does most of the things that a good editor should do, such as scroll, scroll vertically and horizontally, insertion and over-type entry mode, block delete, undo/redo and move, and full DOS 2.0 directory path name support in reading and writing files.

It is easy to learn with a comprehensive command menu screen which makes the documentation an ornament. It was written by the Lattice programmers who left forgotten by the folks who write WP software. They needed easy entry of non-display characters such as control codes and escape sequences, not footnotes, indenting and underlining of block structures looked larger than italic printing for them. Pattern searching won't over spelling checking. So CVUE was born.

CVUE has its limitation. It only supports a minimum text file, but with memory at today's prices, creating and maintaining any file 800 Kbytes long is practical. Anyways, modular source code of structured programs never gets nearly that big. As compensation, CVUE is very compact and fast. Even in 80K computers it has no need for tediously slow overlays to perform its full feature repertoire.

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Product Code:	Lat Price:	Our Price:
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### C-TREE

**B-Tree File Manager, Source Code, No Royalties! NEW!**

A b-tree can be indexed with bugs, so before buying one, ask its age, is a stand of asplugs, this one is a real omelette. C-tree™ has been around since 1978. That means seasoned, sturdy code which hasn't cracked under the weight of prolonged and widespread use.

### LMK

**A Unix-like "Make" Makes Light of System Building in Any Language**

If you have ever built a complex system, you know the time loss and tedium of recompiling, rebuilding libraries and redefining modules because a subset or two of code has changed. There are no shortcuts. You need benches of time to avoid redoing everything indiscriminately.

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How? You write a command file which expresses, bottom to top, all the elements comprising your system and all its dependencies: what gets compiled to make what object file, what options, what is built into libraries, what is to be linked into the final EXE file. Through the life of your system LMK keeps track of the last time every action was performed. Then LMK and, tracking each branch, it looks only for elements which changed since the last dependent element further along the branch, using date and time information in the file directory. Any source file newer than its object file, for example. Only those elements and their dependents are re-made. All other instructions are bypassed.

The command file uses a simple, readable syntax—"prog.obj prog [RECURSE]", for example, says what source file this object file depends on, and says to fill your previously-defined macro RECURSE into the expression, which in this case might be a list of files with hardware drivers, or in another case your preferred string of compiler options.

LMK does not care when programming language you use, it's not just for C. For that matter, LMK can be used for more than programming. It can apply for any set of tasks which can be accomplished through commands issued to the operating system. Try it for repeated reassembly of lengthy documentation, or for assembly of encyclopedias of agreements so that only the dependencies of altered supporting schedules get re-calculated.

Whenever your imagination leads you, LMK will find the shortest path to get the job done. Minimum time, minimum effort software.

Product Code:	List Price:	Our Price:
L2100	\$195	\$175

Its developer has added two very unusual features. C-tree now comes in C source code, revealing all you've ever wanted to know about how b-trees are written. Second, provided you bind it into your library application, you can redistribute it as you wish. There is no source code to royalties.

Thanks to source code which does not deviate from the K&R standard, C-tree can travel. Binary has always meant finding a substitute file manager when you port your work to another computer, operating system, or computer, then changing all the function calls and testing away. There are. There is many environments prove that C-tree gives your application a ticket to anywhere.

C-tree permits any number of layers for a data file, supports duplicate keys, alphabetic or numeric, etc., it's a big product with everything you'd expect. Beyond that it is intelligently designed as both a high level set of ISAM routines to minimize your coding by handling all details of adding a record on its own, for example, and as low level operations which you can access directly. Either way C-tree maintains optimal index structures which will find a record amongst a million ten byte keys in no more than five disk seeks.

And all this is disappointing, now the good part. C-tree's design splits nodes to allow any number of users to access an index file simultaneously even when updates are in progress so that multi-user configurations and adaptation to networks are possible. You must write the record-locking routines, as they are compiler and operating system dependent, but the documentation shows how by example.

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Compilers work with one module at a time. They know nothing of other modules which only meet up at link time. Pre-C can look at all segments of your program at once and report to you any inconsistencies of inter-module references, conflicting data type declarations, parameter lists in function calls which disagree with the functions themselves in number or data type, declarations of external functions which differ from their definitions.

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# PC News

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## Epson/ABC Venture Puts Data on the Air

BY CHARLES BERMANT

NEW YORK—A joint venture between Epson and American Broadcasting Company Video Enterprises has added spice to the global communications stew. The two companies are planning the creation of an electronic-mail pipeline designed to provide PC-users with a near-instantaneous message service using a hybrid of computer and broadcasting technologies.

INDESYS, for Information Delivery System, will draw from the strengths of both its parent companies as well as from some already existing resources. Epson will manufacture the necessary hardware and also handle in-place sales, distribution, and customer support systems. ABC will offer its existing radio and satellite network for the transmission of data.

INDESYS customers will need to make an initial hardware

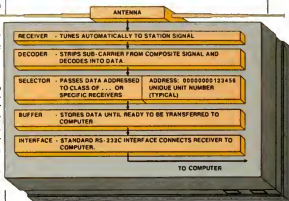
investment of \$250 for an expansion board with 256K of buffer memory. A printer box, priced at \$299, plugs directly into any Epson printer and can receive data without the use of a central processing unit. With the addition of a battery pack, the system can also be used as a portable telex unit.

### In a Flash

Customers without access to an Epson-compatible printer will be able to make full use of the system with just the PC memory board. After the hardware is installed, the customer is charged for use through INDESYS's billing network, with no minimum or maximum use restrictions.

It is possible to send a message through INDESYS to single or multiple addressees in specific remote locations. The information is sent to the INDESYS headquarter's computer, located in Mountain

**Process turns PCs and printers into receivers of instant electronic mail.**



View, California, where the message is then forwarded first to an uplink transmitter and then to a communications satellite.

### Pilot of the Airwaves

Participating local stations then receive the messages and translate the information to subcarriers outside of the FM band, similar to those frequencies used for Muzak and other pay-radio services. Special receivers within either the PC board or the printer unit then catch the transmission and hold the message in its buffer.

A proprietary encryption software program has been developed for security purposes, which, according to INDESYS, "makes it impossible for unwanted parties to intercept data or messages." The access codes can also be changed if a customer doesn't pay the monthly bill.

(continued on next page)

## IRMA Speeds Revolution in Modems

BY VIRGINIA DUDEK

NEW YORK—Digital Communications Associates, Inc. of Alpharetta, Ga. has joined forces with Telbit Corporation of Cupertino, Calif. to develop a new super-fast modem capable of sending data over ordinary phone lines at speeds upward of 10,000 bits per second.

Called IRMA's Fastlink, the new modem automatically determines the fastest possible

transmission speed that a particular telephone line can accommodate.

Fastlink modems can analyze the quality of a phone-line connection, and they constantly adjust the transmission speed to ensure that your data is being moved at the highest possible rate. Fastlink also operates with low-cost long-distance services, and DCA says it is compatible with most other modems.

### Break on Through

H.R. "Johnny" Johnson, president and CEO of Telbit, called Fastlink a breakthrough akin to the "transition from electromechanical typewriters to software-based word processors."

Fastlink sends information to other PCs and to mainframes based on technology developed by Telbit that organizes information into "packets" or

(continued on next page)

# Tseng Chip Betters IBM EGA

BY DAWN GORDON

NEWTOWN, Penn.—Tseng Laboratories, Inc., the manufacturers of the UltraPAK video/expansion boards, has developed working prototypes of an enhanced graphics chip set said to be 100 percent compatible with the IBM Enhanced Graphics Adapter.

Called the ET2000 Series, the three VLSI, 68-pin chips were designed from scratch rather than from reverse engineering of IBM's EGA. This plan was necessary according to president Jack Tseng. "Our chips will do everything the EGA will do and more, and we didn't have to resort to replicating what IBM designed."

The ET2000 Series incorporates all of the capabilities found in IBM's card. The chips will drive PC-compatible monochrome monitors (50Hz), color monitors (60Hz), or dual monitors (50/60Hz). The chips will display high-resolution bit-mapped graphics in the 640 x 350 mode with 16 colors out of a 64-color palette (on an enhanced monitor) or in 640 x 200 and 320 x 200 modes on standard color monitors. The set will also accept downloadable fonts and support the IBM VDI.

In addition to the standard EGA capabilities, the ET2000 chips also include numerous other features: they can generate 132 columns of text, do zoom enlargement, and allow viewing of off-screen information.

The versatility of the ET2000 chips goes beyond just their standard performance. In conjunction with a graphics coprocessor, the chip set will be compatible with the IBM Professional Graphics Controller for 256 colors (out of a palette of 4,096), up to 1,024 x 1,024 resolution, and real-time graphics with a bit-slice processor.

## Compatibility Tests

The company asserts that the chip set is 100 percent compatible with the EGA. It tested this compatibility by running prere-

lease versions of Microsoft's *Windows*, Lotus's *Symphony* and *Framework*, *Lifetree's ColorMagic*, as well as versions of GEM, Dr. Halo, *PC Paintbrush*, *PC Paint*, *AutoCAD*, and *Flight Simulator*. Many of these packages support the high-resolution graphics mode of the EGA-compatible chips.

Although Tseng Labs plans to offer its own EGA-compatible board, the company will also offer the chip set as an OEM product. Jack Tseng has a few ideas of how his own card will be presented but says that it's up to other manufacturers to incorporate their own features with the ET2000 chips. "All we are offering are the chips them-

selves, but there is a great deal that can be done with them. We will probably offer the parallel port that IBM left out and the ability to add video memory without a piggyback expansion card. Although our pricing will be very competitive with IBM for the basic card, memory expansion will be much less expensive with our product." In addition to the features found on the Tseng board, the product will be packaged with downloadable fonts and a font editor for added value.

Tseng Laboratories will announce the ET2000 in November for OEM sales and will ship an EGA-compatible board during the first quarter of 1986. ■

## Revolutionary Modem (continued from preceding page)

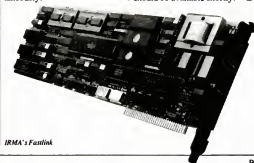
blocks. This feature allows increased access to data banks, enhanced graphics transmission, and local area network gateways to public-switched networks like Telenet and Tymnet.

DCA and Telebit tested the Fastlink's performance for transmitting 360K of data. With a 1200-baud modem, the exchange took 44 minutes. Fastlink transmitted the same amount of data in 5.3 minutes.

In addition to sheer speed, Fastlink has an adaptive duplex feature that allows the modem to match any changes in information flow between a PC and a larger computer. Data can automatically move in either direction or in both directions simultaneously.

Fastlink comes in both standalone and card versions. The circuit board modem fits into PC, XT, AT, or PC-compatible expansion slots and also comes with *Crosstalk-Fast*, Microstuf's enhanced version of its popular communications software package. This software is currently the only package that makes full use of Fastlink's power, although a Telebit spokesperson says that any communications program can be adapted to the modem with a minor change in code.

The board version, with bundled software, retails for \$1,995 and is currently available. The standalone modem with optional software costs \$2,395 and should be available shortly. ■



IRMA's Fastlink

## INDESYS

(continued from preceding page)

INDESYS has three service levels: Maxmail, at 20 cents per page, promises 1-hour delivery; Digitext, with a 4-hour delivery time, will cost 15 cents per page; and the overnight Niemail service will run 10 cents per page. With the latter service, INDESYS is challenging the U.S. Postal Service's cost and efficiency: Rarely does a 22-cent letter arrive at its destination 1 day after mailing.

## INDESYS Exposure

The system will get under way in October in New York, Los Angeles, San Francisco, Dallas, and Chicago, with transmissions being sent through ABC-affiliate stations in those cities. Recruitment of local broadcasters throughout the country is now in progress. FM stations need not be part of the ABC radio network to join, although, as one company source says, network affiliates will probably be "leaned on" to participate.

INDESYS was formed in April 1984, by former executives of Warner Communications's Atari division. Its stated purpose was the development of FM data transmissions capabilities, and several options were investigated before the ABC/Epson agreement was sealed. The transaction was facilitated by The Hillman Company, a Pittsburgh-based venture-capital firm.

"Most joint ventures have turf battles," says INDESYS president Michael J. Moore. "This is the cleanest and most productive joint venture that I have seen."

Moore said that the association with ABC was vital to the operation. With over 1,800 affiliated radio stations now operating, the network reaches every corner of the country. INDESYS will need such an active, wide-ranging system to become a viable communications alternative.

For more details, contact INDESYS at 2425 Garcia Ave., Mountain View, CA 94043, (415) 940-6077. ■

# Artificial Intelligence Seen as the Next Big Step in Software Evolution

## ANALYSIS

BY VIRGINIA DUDEK

DALLAS—Artificial intelligence is popping up literally everywhere and has graduated from chess playing programs to useful applications in word processing and decision support. Most broadly defined as the science of making software intelligent in order to make it more useful, AI's potential applications are just now being tapped by developers. Most industry experts agree that users should not expect future AI development to appear as a bolt of technological lightning but as a gradual way to improve existing applications with built-in "intelligence."

For example, *MindReader* by Businesssoft, Inc. of Annapolis, Maryland, is a word processor that automatically gives you a choice of words when you type a single letter. It pops up in a window containing a menu of words each followed by a symbol or number, and the program automatically finishes typing the word you want. The idea is to reduce the number of key-strokes and increase speed. You can regularly update a dictionary of words and even phrases to ensure that the words you most commonly use will appear in the window.

Another such product is *RuleMaster*, an expert system from Radian Corporation in Austin, Texas. A subclass of artificial intelligence programs, expert systems can store a specialized body of information and use it to logically build decision advisories, diagnose problems, or make predictions. Many expert systems require users to know AI programming languages like LISP and PROLOG, or even require dedicated and still-expensive LISP machines. But *RuleMaster* offers users expert systems features on the PC without requiring knowledge of a language.

*RuleMaster* can be used to build an expert system that fore-

casts severe storms. The program asks a series of questions such as, "How is low-level moisture at 100mb changing?" and you answer from a list of choices. *RuleMaster* then gives its answer: "Thunderstorms occurring near Austin, Texas at 1200 March 13, 1985 MAY APPROACH severe limits."

Both of these programs illustrate the way AI will likely creep into the market. "There will be no abrupt transition to

itself is not selling products. It's not a magic ingredient, but just one more technique in the programmer's tool kit. It will take off when it meets a real need for the user."

## Necessary Horsepower

Arity currently markets *Arity/Prolog Compiler* and *Arity/Prolog Interpreter*, two AI development tools. Arity is using those tools to develop AI applications for the PC.



Businesssoft, Inc.'s *MindReader*

intelligent machines but a natural expansion and improved quality of existing applications," says Jerry Kaplan, principal technologist at Lotus Development Corporation, speaking at a Future Computing conference held June 10 in Dallas. "AI is a collection of technologies, not a separate component; it's a tool, like a compiler."

Beau Shiel, manager of product development at Xerox AI Systems, agrees. "AI isn't a market, it's a technology," Adds Wayne Erickson, chairman and CEO at Microrim, Inc. in Bellevue, Wash., "AI is evolutionary as opposed to revolutionary. It's a set of techniques that can appear in different software products."

But Paul Weiss, vice president of research and development at Arity Corporation in Concord, Mass. notes that "AI

Joe Watson, vice president of the digital systems group at Texas Instruments, thinks AI is more feasible now than in the past because of hardware cost/performance improvements and new software technology. "We have solutions to problems that we did not have before," he claims. TI created many of the development tools for today's vendors and has come out with several hardware and software products that incorporate AI techniques. Among them is *Arborist*, a decision-modeling tool, and *Personal Consultant*, an expert system development tool.

Egil Juliusen, chairman of the board at Future Computing, points out that these AI development tools were only made widely available to vendors a year ago, and product introductions can be expected to start coming in by the end of 1985.

"AI technology takes a lot of horsepower," says Meg Lewis, senior analyst at Future Computing. "As machines become more powerful, developers will target the right time to introduce products."

## Smart Surrogates

According to Juliusen, "AI technology will have a big influence on the industry, but what form it will take we can't predict."

Lotus's Kaplan adds that future AI applications may include personal communications. A computer could act as an "electronic surrogate" for you, coordinating and planning your schedule, for example, because it will "know" your preferences. "You will no longer require face to face interaction for simple transactions, like scheduling," says Kaplan. "Machines will move from being passive tools to active partners."

Although AI techniques are here today and are incorporated into a range of products, some barriers still exist. "One limiting factor of AI and expert systems is the time and cost it takes for someone to acquire the knowledge to use it," says Alvin Barkovsky, vice president of marketing at Silogic in Los Angeles, Calif. He feels that natural language user interfaces will broaden the market from scientists and engineers to include general business users.

Microrim's Erickson thinks, however, that a variety of user interfaces should be considered by software developers, not just the ones, like natural language, that happen to incorporate AI techniques. The trick is to know whether one or even a combination of interfaces, work best with a particular program. "The key is to have products that recognize different interfaces, rather than only one method throughout. If natural language is appropriate, okay. But don't force it to fit if it isn't."

Summing up, Future Computing's Juliusen notes that "by the early 1990s most software will use AI. A lot of it will be replacement applications. It's the next natural evolution of software products."

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**A Burst of Color . . .** AST Research, Inc. has introduced a display adapter board that uses a single PC expansion slot. The **ColorGraphPlus** board runs in both alphanumeric and all-points-addressable modes of operation. In alphanumeric mode, the adapter can run in either an 80-column by 25-row format for low-resolution monitors and televisions, or it can run in a 40-column by 25-row format for high-resolution monitors.

The **ColorGraphPlus** card also supports up to 16 colors in the medium-resolution (320 x 200) mode and up to 4 colors in the high-resolution (640 x 200) mode. AST says that the **ColorGraphPlus** board is compatible with all software written for the IBM Model 4910 color/graphics adapter, but it offers more colors in both high- and low-resolution mode.

The retail price of the **ColorGraphPlus** is \$295, and soon to come is a \$75 memory-expansion kit. AST says it plans to develop graphic products to be compatible with IBM's new Enhanced Graphics Adapter (EGA) and Professional Graphics Controller, as well.

AST Research, Inc. is located at 2121 Alton Ave., Irvine, CA 92714, (714) 863-1333.

**PFS/Merge . . .** It's a tough micro world out there, and sometimes a combined effort is required to rise to the top. **Harvard Software, Inc.** of Littleton, Mass. thinks so and has signed a letter of intent okaying its acquisition by **Software Publishing Corp.** for an undisclosed sum of money.

**Software Publishing** of Mountain View, Calif. is the publisher of the popular **PFS** series of integrated productivity software. **Harvard Software**, a leading manufacturer of sophisticated project management software, is the maker of the *Harvard Project Manager* and the more advanced *Harvard Total Project Manager*. Shaeel Mozaffar, vice president of marketing for **Harvard Software**, said



AST's *ColorGraphPlus*

that both companies hope that the acquisition of **Harvard Software** by **Software Publishing** will give them both a greater depth of resources and a stronger marketing position.

Mozaffar said that **Harvard** had reached a "critical threshold in its stages of growth" and that **Software Publishing's** strong presence in the entry-level project management market would help **Harvard** with distribution and marketing.

Mozaffar also said that at this time, the final details concerning the acquisition could not be disclosed, but that **Harvard Software** had plans to "diversify its product line beyond project management into a new category of products that will further automate management science for the business and academic community."

**Motorola's Supermicro . . .** Motorola Information Systems Group's Four Phase Systems, Inc. has added a new 32-bit, UNIX-based computer. The **Model 290** supermicro has a Motorola 68010 processor and supports up to 12 users. The standard configuration of the 290 has 1 megabyte of memory, an intelligent communications processor, a 52-MB Winchester drive, and a removable 5-MB disk for backups. The system costing \$20,665 supports up to seven 52-megabyte disks bringing the total amount of on-line storage up to 350 megabytes. For more information contact Motorola at 10700 North De Anza Blvd., Cupertino, CA 95014, (408) 864-4873.

## Bigger and Better . . .

Tallgrass Technologies Corp. of Overland Park, Kan. has introduced software that breaks the 32-megabyte limit on disk-volume size. The software, designed for use with Tallgrass's mass-storage units, increases the number of computers that are compatible with those units.

Tallgrass vice president Steven Volk said, "Users of our mass-storage units will no longer be restricted by the DOS limitation of 32 megabytes, which will expand their applications with hard disks."

Tallgrass is located at 11100 West 82d Street, Overland Park, KS 66214, (913) 492-6002.



Steven Volk

## TRANSMISSIONS BY CRAIG L. STARK

One remarkable fact about PC-IRS users is that very few of you are in the wholesale furniture business. This finding emerges clearly from an ongoing survey being involuntarily conducted by the Cal-Pac company, a furniture showroom whose telephone number here in New York is just one digit higher than our own.

If you've ever answered the phone to find, not a prospective customer, but a screaming 1200-baud modem on the other end, you'll appreciate that such experiences, repeated many times daily, must soon wear through the veneer of tolerance

## A linkup to the lowdown about what's happening on PC Magazine's Interactive Reader Service

and restraint on which civilized behavior depends. To paraphrase my local sportscaster, "Give 'em a break." Don't try to beat the busy signals by uselessly trying the next number up.

The only number to dial for PC-IRS is (212) 696-0360. Set up your system for no parity, 8 data bits, 1 stop bit, and Xmodem protocol (if you have it). For any newcomers to communications software, the

Xmodem file-transfer protocol is not the same as the Xon-Xoff terminal "handshaking" protocol. Do not use Xon-Xoff or all your patient waiting to get on the system will have been in vain.

The .ASM (as well as the .COM and .ASC [BASIC]) listings for Steve Holzman's LOCK utility (see "Give Yourself PC Privacy, this issue's Programming column) are now on the

board, together with some programs you've asked for from Power User and Spreadsheet Clinic. And we've added update files (type L:2 from the Files menu to get a list) to our PCUG and BBS listings so you don't have to download them all again to keep current.

As a final note, remember that if you leave a question in the PC-IRS Comment section, you must leave your telephone number as well, without it I have no way that I can even try to get back to you. The message section that is part of other BBS operations is not active in PC-IRS.

# Making Macros and Menus With Alpha's Keyworks

## PRODUCT REVIEW

BY STEPHEN MANES

Holy macros! If software developers have their way, this will be the year the keys of the kingdom will be officially "enhanced." First came *ProKey 4.0* and *SuperKey*. Now Alpha Software bursts in with *Keyworks*, which offers many of the features of its competitors and also the ability to develop customized menu systems for other applications.

Like its predecessors, *Keyworks* can build macros by "recording" keystrokes with a built-in editor, or from ASCII text files. The program offers fixed and variable-length fill-in-the-blank fields, but it omits redefinable keyboard layouts, the expanded type-ahead buffer, the one-finger mode for the handicapped, the ability to use certain keystroke combinations, one-key skip-macro command, and various other features included in *ProKey 4.0* and *SuperKey*.

### Missing Features

Most of *SuperKey*'s special macro features are absent from *Keyworks* as well. *Keyworks* can't include current time, date, path, or drive information in its macros, for example. It doesn't include formatting options and data masks for fill-in-the-blank fields. It doesn't offer a switchable alternate set of arrow keys. It can't cut information from the screen, assign it to a key, and play it back elsewhere. It doesn't let you recall and edit your recent DOS commands.

*Keyworks* also lacks *SuperKey*'s keyboard-lock feature, but since turning off the computer and restarting it breaks that lock anyway, it's no great loss. *Keyworks*'s encryption scheme was clearly added as an afterthought to compete with *SuperKey*'s (it's omitted from the manual and the packaging), the coding process uses a proprietary code apparently far simpler than even the simpler of

*SuperKey*'s two encryption options. Worse, *Keyworks* can't overwrite the original file and erases it simply by removing it from the directory. Since every shred of the original file except for the first letter of its filename is still on the disk, a snooper with *DEBUG* or *The Norton Utilities* could restore it in nothing flat.

### Special Tricks

*Keyworks* does have a few tricks of its own, however. For openers, it allows access to most important DOS functions

line *Keyworks* editor is a plus since it displays all the macros currently in memory instead of one at a time. But this tool is not a true macro editor: It doesn't maintain the integrity of individual commands. Worse, its poor error-trapping can allow you to create horrendous problems throughout an entire macro file.

What is truly unique about *Keyworks* is its ability to create "moving-bar" menus and help screens with what could optimistically be described as ease. You can customize virtually every operation of an applications package by developing a system of menus and screens. The menus really work: You can ac-

line help system, not as pointedly context-sensitive as *SuperKey*'s, needs 51,170 bytes of disk space.

### Rough Edges

As its encryption scheme demonstrates, *Keyworks* is rough around the edges. Alpha includes a utility for converting *ProKey* files to its entirely incompatible format; but the file it created from one of my old standbys disabled my A key. *Keyworks*'s user interface makes it a pain to undo errors. If you work your way through three levels of menus and hit one wrong key, you can't back up a level. With macro lists you can page forward but not backward. The misleading prompt "Enter... Execute" appears when you're just looking at a directory and you can't execute anything at all. The slim manual is incomplete and occasionally incomprehensible.

The menu and window-creation forms react inconsistently to the arrow keys and allow virtually any sort of input, including letters where numbers should be required and numbers at Y/N prompts.

*Keyworks* did work for a while with four out of five other simultaneously memory-resident programs (no go on *Word Finder*) in my torture test. But on that and three other random occasions the program made DOS produce an error I can't remember seeing in 3 years of using my PC: the dreaded Memory Allocation error, which forces a cold reboot. Twice *Keyworks* froze the system in other ways.

So until Alpha Software cleans up its act, this one doesn't make it into my AUTOEXEC.BAT file. In fact, it doesn't even make it onto my hard disk.



Alpha Software's *Keyworks*

without exiting an application. You can display full directory information, rename, copy, and erase files, make and remove subdirectories, change the current drive or path, and even format a disk. You cannot, however, run a program.

*Keyworks* also allows macros to send codes directly to the LPT1: port, a handy trick for setting up a printer from an application program that can't. Like *ProKey 3.0*, *Keyworks* does not impose the potential performance slow-downs of new-generation competitors. With no enhancer, *WordStar* took 40 seconds to print a file of 5,248 bytes into a spooler. The same task took a whopping 95 seconds with *SuperKey* loaded, but it only took 48 seconds with *Keyworks*.

In theory, the full-screen on-

screen editor should allow you to

usually execute a selection by pointing at it or typing its initial. To simplify things, *Keyworks* supplies fill-in-the-blank screens for creating menus and text-only windows. Alas, the only way to rework an existing macro is to use the editor—where on-line help is unavailable and a plethora of curly braces and unfamiliar commands gives you little chance of understanding what to do to fix things.

*Keyworks* allows a maximum of about 7K of macros resident at once—a potential limitation if you intend to use lots of screens. Fortunately, macros can be used to load new macro files, awkwardly lifting the 7K limitation. In its default configuration of about 1,500 macro characters, *Keyworks* takes up 56,528 bytes of RAM. Its on-

**Keyworks**  
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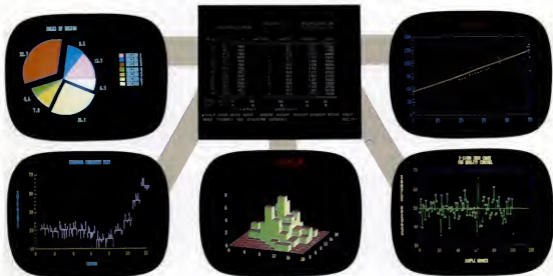
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## COMMUNIQUEs BY CHARLES BERMANT

## No Commies on the Fairway

Notices restricting software sales to certain countries are common, but the one included in 1 Step Software's *Golf's Best-Pinehurst 2* has more than a trace of irony. The list of copyright-ignoring countries where the program cannot be

used or sold reads like a red-bloc roster: Who's Who. America's favorite leisure sport has, admittedly, never been a popular communist pastime, but this program's noble prohibitions will truly help keep the reds off of our finest greens. ■



## High-Tech Honky Tonk

Imagine watching a movie about a turn-of-the-century saloon. It first focuses in on a mustachioed, muscle-bound bartender and then to a pale-skinned beauty. Bright ragtime music fills the air. A dapper guy in tails walks up to the woman. The camera pans around the room, towards the music... revealing a personal computer patched into a MIDI interface and a Casio keyboard.

QRS Music Rolls Inc., which still markets a line of paper piano rolls, is turning ragtime into downtime with its floppy-based automatic music. The 1,000 selections now available on six-song disks range from traditional George Gershwin and Scott Joplin to modern chestnuts like "We Are the World" and "Ebony and Ivory."

According to QRS vice president Robert Berkman, "Paper rolls and magnetic disks are just different forms of software as far as we're concerned." There is no word as to what other improvements will usher the saloon of the past into the digital age: We couldn't confirm rumors about Barroom's *Fight Simulator* or a bartending program called *DrunkTonk*.

Berkman hopes to market the musical disks for the IBM PC later this year. Contact QRS at 1026 Niagara St., Buffalo, NY 14213, (716) 685-4600. ■

Owing to overwhelming reader demand, we are continuing our policy of paying \$50 for suitable items submitted to *Communications*, PC Magazine, One Park Avenue, New York, NY 10016, (212) 593-5276; MCI Mail 157-9301. Only the first 50,000 envelopes will be opened.

## Fun with Press Releases

Microrim Inc., the Bellevue, Wash. manufacturer of *R-base* and *Clout*, gets our press-release-headline-of-the-month award for "Microrim Inc. Ships R-base 5000 on Time." ■

## But AT Still Stands for Almost Trustworthy

According to the humor newsletter *Comedy By Wire*, an IBM spokesperson has denied that IBM-XT stands for "I'll Buy Macintosh Next Time." ■

## No IBMs, Please, We're British

The British edition of PC reports that London's English IBM PC User group has abandoned its namesake machine and transferred its membership records to a Compaq Deskpro. ■

## What's Next—LISA-Stein?

Old movie plots never die, they just get recycled. *The NECEN Voyage* (Addison-Wesley, \$9.95, paperback) is the tale of a mainframe computer that has been taken over by a sinister hacker, throwing everyone from Washington to Boston into chaos. Enter a modern scientific genius, who shrinks a commando team to bit-size and sends them into the computer where they save the day by wresting control of the machine from the forces of evil.

It wasn't so long ago when a team of scientists were miniaturized and injected into a scientist's body during 1966's *Fantastic Voyage*. The ante was as

high, both the safety of the world and Raquel Welch's future acting career were at stake. Who can forget the scene when the corpuses attacked Raquel's wet suit?

But what *The NECEN Voyage* lacks in originality it makes up for in educational value. The terms are illustrated, and the book is geared towards computer novices of all ages.

*The NECEN Voyage* is by no means the last word in old stories that can be rejuvenated with a computer theme. Already in production in California are "Widget," the tale of a cute surfer girl who uses a PC, and an unnamed epic about a young



computer whiz who builds a machine in his ex-girlfriend's image. ■

## Son of Fun with Press Releases

Recently we received notice of a combination writer, spellchecker, and typing aid for just \$150 from a company we'll kindly allow to remain unnamed. The enclosed letter, however, had at least one serious grammatical error,

along with visible traces of Liquid Paper. Hey, you in Sunnyvale—your secret's safe with us, but there are better ways to convince us your word processor should replace *WordStar* or *XyWrite*. ■



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DOWN TIME BY WINN L. ROSCH

# GRiD's Laptop Portable: In the Catbird Seat

Working with a computer can cause headaches—the very thought of any work at all is enough to set my temples throbbing. But I suspect the mental malaise and eyestrain the computer community suffers from reading the LCDs of laptop portable computers are mostly a matter of pride.

Self-respecting computerphiles wouldn't willingly admit that they haven't bought a laptop PC-compatible computer because the pureness couldn't be justified—or even worse in this age of solid-state status—because they couldn't afford one. However, by simply claiming they can't read the squint-provoking liquid crystals they save both face and around \$3,000.

Even granting that LCD screens are hard to read, the biggest shortcomings of laptops are their cost and relative lack of utility. Were there a genuine need for the elegant portability of laptops, everyone would soon have one—even if the screen were in braille.

Suppose, however, you could buy, at close to the going rate, a new PC clone that could handle all your desktop thinking chores and could travel without your hiring a moving van or buying a truss. At the same time, this miracle machine could sweep the one giant box off your desk, eliminate the clutter of cables and add-ons, and even include a built-in standby power supply.

## The Case for GRiD

GRiD Systems believes the new GRiDCase laptop is just such a wonder-worker. From the first look and feel, you know the briefcase-size machine is the Cadillac—or better yet,

Porsche—of laptop computers. Its black magnesium case (15 x 12 x 2 1/4 inches) makes competing plastic computing cohorts seem like toys. The machine is Federal Express-proof, able to withstand 30 g's, and the heft of the GRiDCase makes those numbers seem conservative. A few hours with the surprisingly weighty (12 pounds) GRiD under your arm will do more for your physique than a nonstop week at the health spa.

Sporting a Phoenix Compatibility Systems ROM BIOS, there's little doubt the GRiDCase will run any PC program you can slide into its internal 3 1/2-inch (double-sided, 720K capacity) disk drive or its optional plug-in 5 1/4-inch external drive, which is capable of handling all PC-DOS floppy formats. Four extra ROM sockets let you slide in many of your programs as firmware.

Since the GRiDCase runs a full 16-bit 80C86 microprocessor at 4.77 MHz along with an optional 8087 coprocessor, its performance ought to leave the competition in the dust. Alas, its real speed is not as spectacular as its promise: Peter Norton's SYSINFO program gives the GRiDCase a rating only 1.1 times faster than a plain PC's.

Just in case the threat of eyestrain has actually postponed any laptop purchases, GRiD offers an optional (about \$1,400) bright, clear, orange PC-graphics compatible gas-plasma display for the GRiDCase that puts the typical desktop monochrome monitor to shame.

The GRiDCase has the rest of the laptops in the world beat in versatility. Beside the familiar portable computer accoutrements—screen, keyboard, and

disk drive—it's also well-endowed with ports. In addition to an IBM standard parallel printer port and a serial communications port and phone line jack for an optional internal 1,200-bps modem, it also features extra monitor, keyboard, and expansion jacks.

For office use, you'll want another keyboard. GRiD's is a pain. With a strange key layout (Esc where Ctrl ought to be), its compatibility with the PC's keyboard is very low. For power reasons, the keyboard uses a current-saving hard-contact design—and not a particularly good one. After 2 weeks of use, both the O and E keys had become erratic.

Add the internal modem to an anchored GRiDCase, and one more piece of desktop clutter is gone. Slide in a battery, and your workstation is completely immune to power interruptions. (With the LCD display, I got about 3 hours from a full battery charge before the low-power warning light came on.) When the lights go out and the rest of the world panics, you just light a taper, crack open your GRiDCase, and continue with your work in progress without missing a tick of the internal clock.

The GRiD external expansion system is exemplary. A single cable tethers the portable GRiDCase to its stock of stationary peripherals. The matching add-on components—including a 5 1/4-inch floppy, Winchester, and a network adapter—each feature a pair of rotating connectors that mate to the units atop and below in the stack without cabling.

For a single-purpose, totable computer reserved for taking notes, the steep price of the

GRiDCase (it starts at about \$3,000) might seem out of line, except for the military marketplace, where it's roughly the equivalent of three hammers and a toilet seat. For a versatile, feature-packed desktop and laptop computer, the GRiDCase is well worth considering.

## Update

In response to my earlier exploration of other eyestrain aids, one reader, Rytis J. Sirmenis, sent me information on a glare-reducing panel affixed to a screen-magnifying Fresnel lens, called the Compu-Lenz, that will swell your 12-inch display into 15. It's the same old trick used on the tiny television tubes of the Forties. It looked silly then and still does. However, if the contraption helps you read your screen you can probably live with the embarrassment. Sirmenis is thrilled about the product, but then again, he's president of the company that sells it.

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## What You Get Is What You See

Mark 4 identifies each session with a "page" number. You can flick from one session to another with one keystroke. See each one full screen.

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## Menu? Or Command?

No matter how expert you are, Mark 4 is just your speed. It operates on command, or with a menu, or any combination of the two.

If you need help at any point in your command sequence, Mark 4 gives you suggestions that apply precisely to the task at hand.



## Why Repeat Yourself?

If you make the same calls often, as most people do, Mark 4 can save you a lot of dull repetition. It has built-in command programs to call up and log in to most of the major information utilities.

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— Mark 4 emulates the most popular terminals, including IBM 3101, DEC VT-52, VT-100, and the TeleVideo 900 series. Most other programs emulate one or two.

— In addition to X-PC, Crosstalk Mark 4 supports Kermit, Xmodem, and of course our own Crosstalk protocol.

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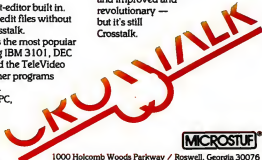
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## PC UPDATE BY VIRGINIA DUDEK

NEW YORK - It's not a bird or a plane, just Version 1.1 of SuperProject by Sorcim/IUS of San Jose, Calif. The project management program now comes with Sideways, a sideways-printing program by Funk Software of Cambridge, Mass. SuperProject's other printing enhancements include the ability to store charts and reports on disk to merge with word processing documents. Spreadsheet reports can also be sent to a printer or disk file or to a SuperCalc data file. Reports can also be written to files that can be read directly by Lotus's 1-2-3 and dBASE. Version 1.1 also supports the Intel 8087 math coprocessor, the IBM Enhanced Graphics Card and monitor, the IBM Proprinter and Color Jetprinter, and the Epson FX printer extended character set. Send the original master program disk, \$90, and shipping and handling charges to Sorcim/IUS.

Other recent developments include Version 2.3 of Optimizing C86 C Compiler, from Computer Innovations in Tinton Falls, N.J. Version 2.3 now supports source-level debuggers such as PFI PLUS, ATRON, and PERISCOPE. Full access to line numbers, global variables, and local variables is also supported. Additional features include a unique structure-name option and virtual drive (RAMdisk) support for the compiler's temporary files. Improved switch processing, 80186, 80286, and 80287 code generation options, new library functions and header files, and a multilevel message warning system to aid in detecting C source code problems are also included. Computer Innovations claims that C86 2.3 compiles code up to 40 percent faster than Version 2.103. "The things we're putting in are moving us closer to an ANSI (American National Standards Institute) standard," says president George Eberhardt. Updates are available from Computer Innovations for \$35.

An advanced version of QS CALL, the asynchronous telecommunications package from Quality Software, Inc. of Newton, Mass., is out. New features include a menu-driven set-up phase to ensure proper definition of the communications link, unlimited file size, and Xon and Xoff support for systems utilizing that method of data flow. Send \$35 for an upgrade and a new manual.

Short takes: Universities can now compile one for the Gipper. Interface Technologies Corporation of Houston, Texas announced an educational discount program on sales of M2SDS, ITC's software development system based on the Modula-2 language. The single unit price of \$80.88 will be reduced to \$50 on purchases of 10 or more copies by a college or university. MaxThink Version 3.0 from MaxThink of Piedmont, Calif. now includes more text editor horsepower, full error checking in the SAVE and WRITE commands, automatic creation of back-up files, and data proofing on all disk I/O. Upgrades are available from MaxThink for \$20 plus tax and shipping. Sapana Micro Software of Pittsburg, Kan. offers Version 1.35 of Mail-Track-I with LetterMerge, a mailing-list management package. New features include Censidian addresses, merge mailing lists, printing in various formats such as Cheshire and Avery, and auto-repeat print format specifications. Send \$10 plus the old program disk to Sapana. Sun Microsystems of Mountain View, Calif. upgraded their VMEbus-based engineering graphics workstations from the 68010 to the 68020 Motorola 32-bit processor. The enhanced Sun-2/130 and Sun-2/160 will be available for \$4,000 each by the end of the fourth quarter of 1985.

Be a contributor to PC Update. Write or call Virginia Dudek, PC Magazine, One Park Avenue, NY, NY 10016 (212) 503-5265.

## MultiMate's New Keyboard

EAST HARTFORD, Conn.—MultiMate International Corp. has announced at its headquarters here a new keyboard specifically created for MultiMate word processing. The MultiMate Business Advantage Keyboard features a series of programmable keys that can eliminate the need for templates for just about any word processing program.

The new keyboard, manufactured for MultiMate by Cherry Electrical Products Inc. of Waukegan, Ill., has three groups of five keys running along its top. The first two groups are programmed with MultiMate Ver-

sion 3.3 functions, such as search and repaginate, and the third group has prelabbed keys with functions only found in MultiMate Advantage. The standard IBM-keyboard func-

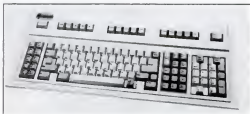
tion keys are also programmed with dedicated MultiMate functions.

However, if you want to use the keyboard with another word processor or if you simply want to reprogram the 15 top-row keys, they can be made to conform to any combination of new

definitions. Blank key caps are included that fit over the programmable keys so you can relabel them for any new functions.

In addition, the new keyboard has an extra dedicated cursor pad that features five MultiMate commands, such as begin line and end line. While these dedicated keys are not yet user-programmable, "That may change," according to Howard Eglowstein, senior engineer in the advanced product design group.

At press time, MultiMate estimated that the keyboard will cost between \$350 and \$450, although no definite list price has been set. The keyboard should be available in retail stores around October 1.



The MultiMate Business Advantage Keyboard

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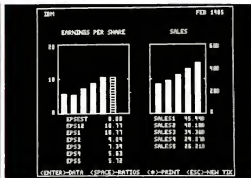
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## Diskette Manager II

An ounce of prevention is worth a pound of cure. So seems the philosophy underlying *Diskette Manager II*, a disk library management system that helps eliminate the question, "I wonder what's on this disk?" The program automatically reads the directory of any disk and creates a record of its files on a catalog disk. Optionally, you can also store text comments about each disk. The cat-



CBS Software's *Standard & Poor's Stockpak II*

alog holds information for up to 200 disks.

A file manager program cross-references files, searches on wild cards, and creates a variety of report formats. The program also prints disk labels from the catalog, including a title, filenames, creation date, number of files, free disk space, and up to ten lines of text comments. It really takes care of some tedious chores and is simple to operate. If you'd rather spend time on your work than on your housekeeping, check out *Diskette Manager II* (Lassen Software, Inc., 468 Manzanita Ave., Suite 5, Chico, CA 95926; \$99.95; for PC, XT, and compatibles; requires 128K RAM, DOS 2.x).

## Text Charts

The new *Text Charts* program offers more features and flexibility than most business graphics software of its kind, including eight text sizes, eight fonts (with beautifully filled characters), eight line and box styles, eight colors, proportional spacing, vertical or horizontal orientation, and the highest quality plotter output available. Each line of text on a chart can be formatted individually as well as left-, center-, or right-justified. You can preview output on screen and send it to either printer or plotter. Sweet.

However, learning to use the range of options should be much easier. The method of entering data and commands is unusual, and the screen display doesn't clarify it much. So you won't get too far unless you take the tutorials and read the thick manual. Oh well. If you want software that can be understood intuitively, look elsewhere. But if you care only for the highest quality output, you can get it with *Text Charts* (Hewlett-Packard, 3410 Central Expressway, Santa Clara, CA 95051; \$200 from H-P dealers; for PC, XT, AT and compatibles; requires 256K RAM, DOS 2.x, color/graphics adapter).

## PC-Key-Draw

Although *PC-Key-Draw* is best suited for professional use by architects and engineers, anyone willing to learn its very extensive range of commands will find it a powerful and versatile graphics editor that is not limited by any means to mechanical drawing applications. Not only are all common graphics and editing commands available, but also functions like animation, screen compression, rotation by color, object, or screen, bidirectional zooming, and continuous slide shows. It can also calculate an object's center, area, or three-dimensional mass.

*PC-Key-Draw* uses the keyboard for input. It is versatile, but not simple to use, despite its combination of menus and commands. The ten function keys select major functions, then you use mnemonic letters to specify individual commands. In some cases, the Ctrl key must be used as well. The bottom line: *PC-Key-Draw* has so many commands that even a reference card isn't sufficient. Thank goodness for the on-line help. *PC-Key-Draw* (Oedware, Box 595, Columbia, MD 21045-0595; user-supported software with \$70 registration fee; for PC, XT, AT, and compatibles; requires 256K RAM, color/graphics).

## Compute

The designer of *Compute* didn't know whether he wanted a sophisticated calculator or a simplified spreadsheet, so he created both. The program lets you solve arithmetic and trigonometric equations on the command line at the bottom of the screen and provides an incredible range of commands for financial functions, probability, optics and nuclear physics.

Above the command line is a spreadsheet of up to 72 columns and 839 rows. You can type numbers or equations into the spreadsheet or send them there from an equation on the command line. But the best part of this little spreadsheet is its English-like language. You name your rows and use the names within formulas. For example, you could type "Old Balance + Deposits - Checks = New Balance" to determine your checkbook balance. It is a very powerful spreadsheet tool, provided you don't need too many cells, and in combination with the superb calculator, *Compute* isn't so much a tool as a tool box. *Compute* (Blaha Software, Inc., 50 Commonwealth Ave., Suite 701, Boston, MA 02116; \$99; for PC, XT, and compatibles; requires 128K RAM).



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# Clean-Up Time For Copy Protection

Lost data, crashed disks, inoperative software—these are the perils of today's haphazard copy-protection schemes. It's time to straighten out the mess once and for all.

**Y**ou are a victim, but you needn't be passive about it. The current crop of copy-protection schemes render the programs they purport to protect all but useless. Furthermore, they can actually incapacitate your computer.

Many programs are distributed on disks that have scrambled sectors, hidden files, and blown tracks so that they can't be reproduced. Their installation programs can read the nonstandard stuff, and so you can make a working floppy that is itself uncopyable.

You can install some of these copy-protected programs onto your hard disk as well. They typically work by creating hidden files on your hard disk, then scrambling a track or a few directory entries so that you can't read them.

It sounds innocuous enough, but hard disk copy protection is a minefield. Too many techniques are used in too many different ways on too many hardware configurations. Sure, free enterprise is wonderful, but not when your data is at stake. The biggest danger is when different techniques and hardware begin to conflict with one another. Then you can wind up with lost data, crashed disks, and inoperative versions of expensive programs.

Who's to blame for this sorry state of affairs? IBM, of course, which could have built copy protection into its hardware—but chose not to. Is this another cheap shot at Big Blue? Well, almost.

The only effective, universal way to do copy protection is with hardware. Since that might cost hardware manufacturers a piece of their market share and

since it's axiomatic that hardware companies won't do anything that might impede sales, they won't do anything to clean up the copy-protection mess. The upshot is that software companies try to fill the gap with kludges.



Bill Machrone

## Technology to the Rescue?

Let's pretend for a moment that software companies can accomplish what the hardware companies don't want to do: standardize. AST has just announced a promising security system, called Knight, that doubles as a DOS shell. It uses its own encrypted directories instead of standard DOS directories to protect files on the hard disk. You supply the passwords that let you get at hard disk files and subdirectories. You can also encrypt data and executable files if you feel the need.

Knight does the basic job of denying hard disk access, but software vendors

still need to get their act together and come up with a better way to distribute programs on floppy disks—how do you get your disks to the users in such a way that they're uncopyable but still usable? This could be done in conjunction with a program like Knight.

One way would be to use DES (Data Encryption Standard) to encode some or all of the program. You would give the visible portion of a serial number embedded in Knight or a similar product to the vendor by phone. A clearinghouse computer system would generate a unique key to unlock the software. It would drive a copying utility that would put a working copy of the program onto your hard disk or another floppy.

## Hey, Rube!

The above scheme is a computer-age homage to Rube Goldberg. "Hey, Rube" is also what they used to yell at the circus when a brawl broke out. And that's just what would happen if anyone were dumb enough or insolent enough to try to implement such a scheme on a scale that's sufficiently wide for it to work. It would be easier to bring back Prohibition.

The situation has gone too far. Users make backup copies at will with commercial copying programs, as is their right under U.S. copyright law. Patches and programs get around the infuriating need to insert a key disk, as befits the dignity of any hard disk user.

The software industry gave up on copy protection in the CP/M marketplace and created giants such as *WordStar* and

*dBASE II*. Would Lotus be as successful today if its star product, *1-2-3*, had not been copy protected? Of course it would. Oh, a few more pirated copies would have been made, but mostly by people who

wouldn't have bought a copy anyway.

Companies, by and large, have developed the maturity to respect software copyrights. It's time that the software industry recognized this fact.

#### New Columns

Changes are afoot again in *PC Magazine*. In an industry where change is the only certainty, we change constantly to best reflect your wants and needs. We've made product reviews more comparative, so you can make more-informed purchasing decisions. We've added more forums and opportunities for reader interaction. First we added Spreadsheet Clinic, then Power User. We'll be adding another of these tremendously useful clinics shortly.

*PC Magazine's* Interactive Reader Service generates a continuous stream of inquiries. You want to know what we think about specific products and combinations of hardware and software. You want to know how to do specific tasks with your existing software. We've never been shy about expressing our opinions, so we'll share them with you in our new ask-the-editors column. It'll be the free-wheeling, on-target kind of editorial you've come to expect from us.

On the other side of the coin, we know you like to think about computer technology and how you relate to computers. That's why we introduced two new columns in the front of the magazine. Ron Jeffries' Quantum Leap column talks about future technologies and the people and things that will change our lives. Ron publishes a highly respected newsletter (*The Jeffries Report*) and is habitually 18 to 36 months ahead of the industry. His view of emergent products and technologies is an informative counterpart to our product reviews, which are so firmly rooted in the present.

Stan Augarten alternates with Steve Manes in looking at the human side of computers in our society. The warmth and individualism of their observations make their views worthwhile in any magazine and especially germane in *PC Magazine*.

Stan is the author of two computer-related books. His view is sensitive, analytical, philosophical.

Steve's acerbic wit and pointed observations have graced the pages of *PC Magazine* almost from the beginning. He has a firm handle on both the realities of using computers in our daily lives and the absurdities they can introduce. ■

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# Letters to PC

## PC Makes Life Easy

I have had a subscription to *PC Magazine* for the last year and a half. I love the magazine and enjoy reading it every other week. Many of the articles are useful to me, especially the PC Tutor, User-to-User, and Programming columns.

I do have one problem with the magazine. I often read an article, and later when I want to use it again, I don't always remember which issue it's in. As a result, I spend a lot of time looking through each issue and end up with a large mess of magazines piled left and right. I wish you would publish an index to your articles. This would make my life a lot easier.

Paul E. Long  
New Providence, New Jersey

*We'd love to make your life easier, especially when it comes to finding articles in back issues of PC Magazine. We have an index for articles contained in all of Volume 3 through Volume 4 Number 12 on the PC Interactive Reader Service, our bulletin board. When you want to find a specific article, you can scan or download this index by calling (212) 696-0360 24 hours a day, at 1200 baud, no parity, 8 data bits, 1 stop bit. We'll continue to update the index to keep you up to date. You'll also find many of your favorite PC Tutor, User-to-User, and Programming columns on the bulletin board.—Ed.*

## How Unique Is OmniTel?

I was appalled at the tone of M. David Stone's article about OmniTel's modems in "OmniTel's Encore Performance," (*PC*, Volume 4 Number 11). Who are you kidding about the "uniqueness" of these products? Stone seems to go out of his way to identify OmniTel's Hayes compatibility, but how does this make the OmniTel modem stand out from the rest, as he says it does?

Stone uses the phrase "Hayes compatibility" ten times and also talks at

great length about *Crosstalk XVI*, which is bundled with the modem. He writes, "Crosstalk is an integral part of that package and lets OmniTel come extremely close to the ideal of plug-in and go." At least a half dozen other modem manufacturers also bundle *Crosstalk* with their modems, so OmniTel is hardly



a prime example of an innovative vendor. Also, with its complex commands, how can anyone call it a "plug-in and go" package?

Stone did mention the faults with the manual and the problems with the AM reception. But these problems were glossed over by Stone's assurances that OmniTel would fix them.

I think your readers would be better served if *PC* would limit its articles to evaluating products on their functional merits, not on alleged uniqueness. What about OmniTel's ability to cleanly transmit and receive data over the phone lines? No mention of this was made. Don't you think this is an important feature to discuss? I would think so—that's a modem's primary function.

William T. Bagley, Jr.  
San Rafael, California

M. David Stone replies:

*Far from calling the OmniTel modems unique, I began by saying that given all the Hayes-compatible modems on the market, it's hard to get excited about yet another one. However, as I said, "There is always room in the marketplace for a*

*well-designed, low-cost product, particularly if it offers something beyond a 'me-too' approach."* The little bit more that OmniTel is offering includes such things as an optional RS-232 connector on the modem board as well as other features I covered in the article. It also includes complete Hayes compatibility—as opposed to quasicompatibility found in most so-called Hayes compatibles. None of these features make the Encore 1200 unique. But taken together, they add up to something more than "me too."

Mr. Bagley thinks I glossed over OmniTel's problems, but as I said in the review, OmniTel had already solved the AM reception problem. The only reason for mentioning it was that some units were shipped before the problem was discovered, and OmniTel says it will fix those units free of charge. As for other difficulties—such as those with the manual—I believe it is only fair to report when a company admits that it is aware of problems and is making an effort to fix them.

## Definition Discrepancy

M. David Stone's article "Picking the Proper Protocol" (*PC*, Volume 4 Number 12) is in error about the Xmodem protocol on several points.

The Xmodem protocol is really the Christensen protocol, developed by Ward Christensen in the late 1970s. Ward, using the CP/M operating system, developed the first microcomputer bulletin board system. The Christensen protocol is often called the Xmodem protocol because the CP/M bulletin boards use a program called Xmodem to accomplish protocol file transfer. In fact, a number of CP/M modem programs, including Ward Christensen's *MODEM*, use his protocol.

The Christensen protocol does not prohibit multiple file transfers. It is the specific implementations that will or will

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## LETTERS TO PC

not allow that to be done. Ward's *MODEM* program had the capability to transfer multiple files using wild-card file specifications, and many other CP/M modem programs have this capability as well. At least one DOS program has such a capability—*MEX*, from Nightowl Software.

Stone fails to mention the CompuServe A and B protocols. CompuServe has been using these protocols for years and has recently released the specifications to the public. I think the A protocol is more efficient than the Christensen protocol.

J.D. Kronman  
Los Angeles, California

M. David Stone replies:

*Unfortunately, the definitions of Xmodem protocol and Christensen protocol are not as simple as J.D. Kronman suggests. In fact, the Xmodem protocol goes by several names, including the CPMUG protocol, the MODEM7 protocol, and many others. Worse yet, the term Xmodem protocol means something different to the CP/M bulletin board community than it does to the PC-based bulletin board community.*

*Given the subject and length of my article, there seemed to be no point in pursuing that track. Whatever the correct definition is, most of the people in the PC-based bulletin board community use the term Xmodem the same way I used it in the article. As others have pointed out in discussing this issue, it doesn't really matter if a given car is really a Chevrolet. If people call it a Chevy, then it's a Chevy.*

In "Picking the Proper Protocol," M. David Stone is correct in stating that Kermit has advantages over other file-transfer protocols. However, he is mistaken when he says it has not yet been incorporated in any well-known communications programs.

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## USER-TO-USER

to read as follows:

A>debug numoff.com

And third, change the one that reads

xxxx:0108 and al,bf

to read

xxxx:0108 and al,df

If you want to toggle on any of the toggleable shift keys, you can see what hex numbers to substitute after the

xxxx:0108 or al,

in the CAPSON.COM instructions, by running the following BASIC program:

```
10 'SFTSHOW.BAS
20 DEF SEG=0
30 LOCATE 10,10,0
40 PRINT HEX$(PEEK(1047))
50 GOTO 30
```

and then pressing any combinations of left and right shifts, Ctrl, Alt, Ins, NumLock, CapsLock, and ScrollLock keys. (You'll have to hit Ctrl-Break to exit this small program when you're done.) The number printed on the screen follows the "or al," instruction at address 108. Remember this number; you'll need it below (where num1 is mentioned). And remember to give any new toggle program its own new name.

Once you've created a program to toggle on a particular key, you can create a corresponding one to toggle it off. Follow instructions for CAPSOFF.COM (giving your new program a new name, of course). You can see what hex number to substitute after the

xxxx:0108 and al,

by getting into BASIC and typing:

PRINT HEX\$(%num1 XOR 255)

substituting the hex number you chose in the SFTSHOW.BAS program for the num1, and putting a &H prefix on it.

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Function	R:base 5000	dBASE III
<b>SORT</b> 1,000 rows of 8 columns each on a dollar field by amount.	26 seconds	65 seconds
<b>SEARCH</b> 1,000 rows for unique number in non-keyed field.	7 seconds	14 seconds
<b>REPORT</b> with one lookup to a second table stored to a file.	6 minutes, 49 seconds	11 minutes, 8 seconds
<b>PRINT</b> a report of sorted data with subtotals.	6 minutes, 39 seconds	10 minutes, 30 seconds
<b>TOTAL</b> (All functions performed in sequence.)	14 minutes, 1 second	22 minutes, 57 seconds

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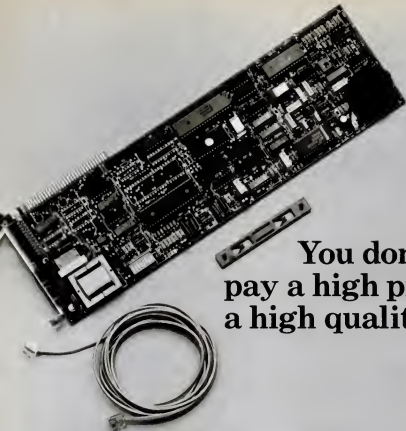
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# The Vagaries Of WYSIWYG

A good word processor should give you the best of all worlds: simple on-screen formatting while you're writing and print formatting that previews your final printout in two ways.

**L**ately, I've been thinking a lot about WYSIWYG (pronounced wizzywig). It's an excessively cute term for a very important issue in word processing, graphics, and just about anything else that involves detailed concern about the appearance of printed material. WYSIWYG is an acronym for "what you see is what you get." And when you think about its real meaning, it leads to some interesting observations about the way computing equipment and software work.

Anybody using a word processor today may not understand how such an expression got invented. That's because nowadays there aren't any really terrible word processors (although you might think differently).

In the early days of personal computers, the procedure that was jokingly called word processing was often split in two. One half was simply a text-editing program that let you compose your writing but left it a mess on screen. The other half was a print formatter that laid out your edited text on the printed page with justified paragraphs, page breaks, headers, and other embellishments that made it look pretty. One half talked to the other through print-formatting commands embedded in the written material in an ugly, obtrusive way.

That, of course, was not word processing. It was just an evil hack that did the trick until the software that did the job properly was finally developed. Amazed at the transition from bad to good, old-timers used the phrase "WYSIWYG" to spread the gospel of software that

showed your text on the screen exactly the way you'd see it printed.

## Appearance versus Reality

My introduction to word processing came on a Wang system that set the stan-



Peter Norton

dard for dedicated word processing computers. Even now, the *MultiMate* folks are happily getting rich by imitating the Wang word processing style on PCs. Since I really loved the refinements that Wang word processing gave me, I made all the text that I wrote in those days neatly justified. That's when I discovered the dark secret concealed under the name of WYSIWYG: What I saw only *represented* what I got.

Everything I wrote on the screen looked neatly justified, and so did the printed version. Only the printed version didn't have exactly the same words on the same lines as the screen version did.

What Wang's software gave me on the screen was a reasonable approximation of the way the printout would appear, but that was all.

There are a variety of practical and technical reasons why the screen and the printed page have to differ. One is that if you're going to print with a line wider than the 80 characters that can appear on the screen, it's probably better from the perspective of user convenience to have text folded into shorter lines on the screen instead of showing them in their true width, partly scrolled off one side of the screen. Another sound reason for fudging on WYSIWYG is proportional spacing. Even a good high-resolution graphics screen can only roughly depict the layout of proportionally spaced printing, and a character-only screen like the ever-popular IBM monochrome monitor can't even give it a try.

## Alarums and Distractions

WYSIWYG is often a terrible idea. If you're going to print out something double-spaced, it's a shame to waste every other line of the display screen just to show the spacing.

It's amusing, but not productive to watch the antics that go on when you type on a line that's set to be centered, right-aligned, or—best yet—justified. While you're typing, you see words dancing a jig on the left and right side of the screen as the filler spaces are automatically inserted or removed. That's a very good way to slow down your thinking and break the rhythm of your work, all in the name of WYSIWYG.

### Adding a Touch of Class

On the other hand, sometimes you do want WYSIWYG, especially when you're simply polishing the finished appearance of your material. That's when

you discover that there are two kinds of WYSIWYG: One makes the screen take on the same style as the printed page (titles centered, paragraphs justified, and so forth). It shows you how the final

printout will look, though each printed line may not coincide letter for letter with what you see on the screen. The other shows you, character for character, exactly what will be on the printed line, even if that makes the screen display look a little strange (for example, by showing a line that's wider than the screen on two lines).

There are at least three different ways of showing material on the computer's display screen. One gives you straight, no-fuss composing without worrying about appearances. The others are the two variations of WYSIWYG: showing how it's going to look in a given format, and showing how the text will fill out that format.

The introduction of printers like the Hewlett-Packard LaserJet is one of the reasons that these refinements are important. I'm told that people are snapping up these \$3,500 babies in amazing numbers, and now that I've got one myself, I know why. The transition to a typeset-quality laser printer is just as dramatic and impressive as the transition from a crude, old-style dot matrix printer to a letter-quality daisywheel.

### The Last Word

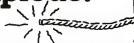
But when you get a printer of that quality, you need a word processor to match. One, for example, that knows how to cope with WYSIWYG. To the best of my knowledge there's only one word processor that can display written material on the screen in the three ways I described above, and that's *Microsoft Word*.

The most sophisticated of the factors I've been talking about—the ability to distinguish between the two versions of WYSIWYG—turns out to have been designed right into *Word*. *Word* lets you switch the screen formatting into or out of what the program calls the "printer display" option.

Printer display ON shows me, line for line, character for character, the way the text will fill out the format: OFF shows me a fair representation of the way it will look, with justification and all the frills. Switching between the two modes takes just a quick change of the option setting.

While Microsoft has found a way to handle the two WYSIWYG variations,

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screen display during text composition remains a problem. Anyone who has worked on a rough draft knows that seeing things the way they'll appear when printed is not always the best way when you're writing. Who needs double-spacing and the distraction of justified text jumping around on the screen while trying to put together words that make sense? *Word* may not have solved this part of the problem, but it has come up do with a workable solution.

#### Going in Style

*Word's* tactic is to use a device called a style sheet. Style sheets define how you want your stuff formatted—this word in italics, that paragraph justified, the headings centered. What makes a style sheet special is that it allows you to decouple the formatting from the written text.

Here's how it works: With a style sheet, you don't make a paragraph double spaced and a heading centered, per se. Instead, you give the paragraph and the heading each some symbolically named style, say P for the paragraph and H for the heading.

The magic is that you can switch from one style definition to another. For example, while you're composing text on the screen, you load a style sheet that defines how paragraph type P should look. A sensible choice would be single spaced, formatting to the width of the screen, and no justification. When we're ready to print, we switch to a printing-oriented style sheet that's double spaced, justified, and the right width for our paper margins.

Switching style sheets makes it possible to have the best of all worlds: simple on-screen formatting while you're writing, and sophisticated print formatting mimicked on the screen in two ways.

The only drawback, at least as *Word* exists now, is that the two types of style sheets required (one to write with, one to print from) aren't integrated. To switch between the fine-tuned writing and printing formats, you have to pause and run through a series of commands that retrieve the right style sheet from disk.

Probably the next generation of word processing software will take us into even further stages of refinement, which

ought to include the full integration of writing and printing formats that I've been talking about. Other advances such as proportionally spaced characters should also become possible as very

high-resolution display screens appear on the market in quantity.

Until then, it looks like Microsoft's way of handling WYSIWYG makes *Word* the ultimate in word processing. ■

The advertisement for 'Fancy Font' software features a collage of text samples in various styles. At the top, 'Fancy Font' is written in a large, elegant script. Below it, 'Social Invitations' is in a bold, outlined font, and 'Emphasis' is in a green, outlined font. A musical staff with notes is shown with the text 'Let us join in joyous singing'. Below that, 'Лучшая' (Best) is in a large, outlined font, and 'Diplomas' is in a bold, outlined font. '¡Español!' is in a bold, outlined font, and 'Clean' is in a bold, outlined font. 'Fancy Font' is repeated in a large, outlined font, and 'handwritten' is in a cursive font. 'COMPUTE' is in a bold, outlined font. On the left, the words 'BLOCKS' are written vertically in a bold, outlined font. On the right, there are several small icons: a heart, a diamond, a cross, and a plus sign. At the bottom, the text 'Dot Matrix Made Beautiful' is written in a large, outlined font.

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# Buy A Local Area Network For Your Law Office—Less Than \$100 Per PC

InfoWorld on EasyLAN  
"Any product that brings down the cost and improves the ease of use for LANs is for the better."

*"All the networks I looked at cost in excess of \$5,000 to interconnect my three office PC's. EasyLAN cost me \$356 including cables and tax. The EasyLAN installation was completed in just over one hour."*

*For the law office, EasyLAN functions and ease-of-use are superior to the expensive LANs. For example in the evenings or weekends, using EasyLAN and a modem from the PC AT HOME I can copy files or word processing documents to and from the law office PC's."*

Douglas J. Gray  
San Francisco Bay Area Attorney

**STOP** buying expensive duplicate PC peripherals. Usually your peripherals just sit idle. If your office owns two or more PCs can you justify a costly printer and multiple disk drives for each PC? How often are your printers actually busy? Thirty minutes a day? An hour a day? Even your expensive hard disk is used infrequently.

The obvious solution to avoid expensive duplicate peripherals is a local area network that allows you to share printer and disk drives. But until now LANs have cost in excess of \$1,000 per PC.

## INTRODUCING THE EasyLAN OFFICE NETWORK

EasyLAN™ shares printers and disk drives between IBM PCs. EasyLAN can save you \$1000 or more per PC by eliminating duplicate equipment purchases. EasyLAN advantages:

- EasyLAN shares printers, disk drives, and information
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EasyLAN's low price matches your cost-sensitive budget. It is the law office network solution for less than \$100 per PC including cables and software.

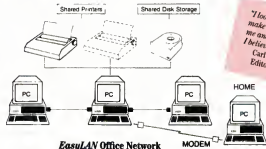
EasyLAN performs its operations concurrently in the background. EasyLAN communications, file transfers and printer operations all take place while each PC simultaneously performs such normal DOS applications as Lotus 1-2-3,™ WordStar™ and dBASE.™

## EASY TO OPERATE

EasyLAN network software allows you to share printer and disk peripherals. PCs are connected by EasyLAN

cables plugged directly into your PC's standard serial communication ports and EasyLAN can be used with digital PBXs. EasyLAN supports geographically separated PCs using modems and dial-up lines.

EasyLAN's performance meets your office requirements to move word processing documents between PCs. For example, EasyLAN can move a 10 page legal brief between two PCs, as a background operation, in less than one minute!



EasyLAN loads automatically when you turn on your PC's, and all EasyLAN operations may be started from any connected PC.

Printer sharing operates transparently with existing programs. Print files are automatically written to disk and scheduled for printing. Multiple printers per PC may be designated for specific office tasks.

For example, one PC can interface with Printer 1 for general purpose output, with Printer 2 for continuous-

form letterhead stationery, and with Printer 3 for printing continuous-form invoices.

All communication operations are protected by optional passwords and disk directory access restrictions.

## EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the EasyLAN cables into existing serial ports. EasyLAN's PRINT, COPY and DIRECTORY commands are very similar to DOS commands.

*"I look for those products that make my job easier and save me and my company money. I believe EasyLAN does both."*  
Carl Warren  
Editor, Mini-Micro Systems

## EASY TO ORDER

EasyLAN is immediately available and easy to order. For a two PC network, start with an EasyLAN Kit. For each additional PC in the network order an EasyLAN Expansion Kit.

The EasyLAN Kits include program diskettes, manuals and cables, which are shielded to maintain signal quality. All parts are warranted for one year. EasyLAN program diskettes may be purchased individually; you supply your own cables, modem links or PBX connections.

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BUYERS GUIDE TO

# PRINTER UTILITIES

Printer Boss  
Connecticut Software

Sideline  
Connecticut Software

Sideways  
Funk Software

Brand X  
Typical

## Custom font design

Draft mode	YES	NO	NO	YES
Quid density ... 16 x 24 dots/char	YES	NO	NO	NO
LO-1500	YES	NO	NO	NO
LO-1500	YES	NO	NO	NO
LO-1500	YES	NO	NO	YES
Graphics mode screen display	YES	YES	NO	NO
Single-key current character test print	YES	YES	NO	NO
Custom font loading from menu	YES	YES	NO	YES
Unlimited custom font library	YES	NO	NO	YES

## Alternate character sets on menu

IBM Matrix character set	YES	NO	NO	NO(7)
IBM Graphics 1 character set	YES	NO	NO	NO(7)
IBM Graphics 2 character set	YES	NO	NO	NO(7)
IBM Screen character set	YES	NO	NO	NO(7)
IBM APL set	YES	NO	NO	NO
Graphics characters link vertically	YES	YES(8)	NO	NO
Simulated download, MX, RX, etc.	YES	YES(9)	NO	NO

## Supports pathnames

Configuration, font and print files	YES	YES	NO	NO
-------------------------------------	-----	-----	----	----

## Printer format control

Elite, compressed, enhanced, etc	YES	YES	NO	YES
Line spacing	YES	YES(9)	NO	YES
-n/180 (LO-1500)	YES	YES(8)	NO	NO
Right & left margin	YES	YES(8)	NO	YES
Set form length lines & inches	YES	NO	NO	YES
Set undirectional printing	YES	NO	NO	YES
Set half-speed & proportional printing	YES	NO	NO	YES
Select 9 Epson language sets	YES	NO	NO	YES

## Letter quality graphics printing

Double density graphics	YES	NO	NO	NO
Quad density graphics	YES	NO	NO	NO

## RAM printer buffer up to 32K

Buffer on/off control	YES	NO	NO	NO
Print current buffer control	YES	NO	NO	NO
Abort current buffer control	YES	NO	NO	NO

## Command line printer setup control

Autobex, bat file operation	YES	YES	NO	NO
Unlimited stored settings recall	YES	YES	NO	NO

## Unlimited menu setting store & recall

Single-key reset to default settings	YES	YES	NO	YES
Configuration file settings storage	YES	YES	NO	NO

## Sideways printing

Menu selection of 6 font sizes	YES	YES	YES	NO(6)
Full 256-character fonts	YES	YES	NO	NO
Sideways font design	YES	YES	NO	YES
One-piece "glued" spreadsheet output	YES	YES	YES	NO
Character & line spacing control	YES	YES	YES	NO
Left margin control	YES(10)	YES(10)	YES	NO
Top & bottom margin control	YES	YES	YES	NO
Paper width choice(8" or 11")	YES	YES	YES	NO
Printer selection from menu	YES	YES	NO(1)	NO(1)
Menu printer port selection	YES	YES	YES	YES
Commands independent of Lotus version	YES	YES	NO(2)	YES
Spreadsheet page setting constant	YES	YES	NO(3)	NO(11)
Requires input of # of rows ONLY	YES	YES	NO(5)	NO(11)
Avoids user calculation of "gluelines"	YES	YES	NO(4)	NO(11)

## Special features

Typewriter output mode	YES	YES	NO	YES(8)
Printer setup string feature	YES	YES	NO	NO
Print direct from word processor	YES	NO	NO	NO
Supports function keys	YES	YES	NO	NO
Master select code feature	YES	NO	NO	NO
Enable Epson NLO option	YES	NO	NO	NO
Directory default change from menu	YES	YES	NO	NO
Drive default change from menu	YES	YES	NO	NO
Indicates unavailable options	YES	YES	NO	NO
Single-key sample print routine	YES	YES	NO	YES
Printer selection from menu	YES	YES	NO(1)	NO(1)
Mouse software interface	YES	YES	NO	NO
Help screens	YES	YES	NO	NO
Single menu, all features	YES	YES	NO	NO

## Price

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If you bought  
**Sideways,™**  
it's time to  
upgrade.

To  
**Printer Boss.™**

Printing spreadsheets sideways is one of the handiest software tricks to come out of the PC revolution. And Sideways™ is a nice little program. But...

**Sideways doesn't** support pathnames, and doesn't let you design your own sideways character font, and doesn't let you store an unlimited number of menu settings, and doesn't let you call menu settings from a command line or batch file, and doesn't give you typewriter output mode. And Brand X doesn't either.

**Printer Boss does** give you all of these things, plus almost everything else you could ever want in printer utility software for the dot-matrix printer, including two letter quality print modes (see chart). And it's all controlled from a plain-English menu, with a few keystrokes, and all controllable via command line from an autobex .bat file.

**And Sideline™** is for those who want sideways printing only, at a special price of \$59.95. It includes sideways printing, sideways stored design, typewriter mode, command line input, menu settings storage and much more.

**Don't settle for less.** If you bought Sideways, or Brand X, it's time to upgrade. To Printer Boss. Or Sideline. From Connecticut Software. For the IBM-PC, PCjr, XT, AT and compatibles, 128K RAM, one double-sided drive and PC-DOS 2.0, 2.1, 3.0. Runs on all Epson and IBM dot-matrix printers and all compatibles. Printer Boss \$139.95, unprotected backup \$29.95. Sideline unprotected \$59.95. Shipping \$4.00 each, outside USA \$15.00. COD add \$2.00, USA only. VISA, MC, money order or check. Purchase orders accepted. Dealers welcome. Free info.

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NOTES: Comparison of Printer Boss & Sideline V5.0 01Apr85, Sideways V2.01 Purchased 02Apr85 (1)Requires exit to installation program (2)Requires different procedures for Lotus versions 1, 1A and 1A+ (3)Requires loading Sideways list to check possible number of lines per page for formatted line (4)Not always, user must calculate gluelines number are suitable multiple of page length for unformatted lines (5)Printer Boss and Sideline require only filename and number of rows in spreadsheet (6)Font size selectable on downloadable printers only by print mode selection (7)Not provided as menu choice but partially as font line choice (8)Available only on some printers (9)Typewriter mode only (10)One printer setup string (11)Does not provide horizontal segmentation or "gluing" TRADEMARKS Sideways a trademark of Funk Software Inc. Epson is a trademark of Epson Corporation



# Connecticut Software

# Visions of a Desktop Supercomputer

What will it take to bring the power of a Cray within personal reach? Putting gallium arsenide and silicon on the same chip may be the next step toward building the personal supercomputer.

**I**t's sometimes fun to dream of owning a new Ferrari, even if you drive a rusty old 1967 Volkswagen. And the computer equivalent might be to dream of having your own desktop supercomputer, while staring at the fading monochrome screen of a battered 1981 PC.

This dream of a cheap supercomputer—"the Cray for the rest of us"—is still far in the future. Will it ever happen? It could, if "wafer-scale integration" is perfected. Wafer-scale integration involves using an entire six-inch diameter, semiconductor wafer as one large integrated circuit. Since a single wafer might include most of the logic for a powerful minicomputer, connecting several wafers would result in an inexpensive computer with high performance.

So far, wafer-scale integration hasn't been successful. Some of the best and the brightest have tried and failed, notably Gene Amdahl, the computer architect who designed the original IBM 360. His well-financed effort to build a computer using wafer-scale integration has been abandoned. Some less ambitious wafer-scale efforts are under way, but none are expected to create the superchips needed to build our "cheap Cray."

Light, rather than electronics, could hold the answer to at least some of the problems of wafer-scale integration. Recent experiments have shown that it is possible to build a new type of integrated circuit that uses light instead of electrons. Even more intriguing, it may be possible to combine optical circuits with high-speed electronics on the same wafer of gallium arsenide.

Gallium arsenide is one of the key materials used in optical integrated circuits. According to Dr. James Merz, who heads a gallium arsenide research team at the Santa Barbara campus of the University of California, this is so because galli-



Ron Jeffries

um arsenide is a semiconductor with good optical and electronic properties: electrons can move much faster than is possible in silicon. Gallium arsenide is used to make some of the fastest electronic devices developed to date, such as the "high electron mobility transistor" (HEMT) with switching speeds in the low picosecond range. (A picosecond is a thousandth of a billionth of a second.)

A so-called "III-V compound semiconductor," gallium arsenide has atoms of two elements—gallium and arsenic—in contrast with silicon, which has just one element. The designation "III-V" refers to the columns of the periodic

chart where the two elements are located. Gallium arsenide is a "direct band-gap" semiconductor, while silicon has an "indirect band-gap."

Since my knowledge of quantum mechanics is pretty fuzzy, we won't go into all the details of why this is so. It has something to do with the fact that in direct band-gap semiconductors the conduction and valence bands have extrema at the same point in momentum space. This means that electrons and holes can recombine to give off light—photons—very efficiently because they don't have to change their position in space or their momentum. Put another way, the conservation of momentum and energy is simple in *direct* band-gap material, and difficult in *indirect* band-gap material.

Thus, gallium arsenide is an efficient light source, exactly what you'd want for building a laser, a vital component of optical integrated circuits. Since it also happens to be an excellent material for making fast electronic devices, gallium arsenide is ideal if you want to combine optical and electronic devices.

The new chips, called "optical intercircuits," have optical building blocks such as laser diodes, photodetectors, and light waveguides all on a single slice of gallium arsenide. "Big deal," you say, "diode lasers and detectors have been around for years." And that's true: individual or "discrete" optical circuits have been made from semiconductors for some time.

What is something of a breakthrough is that all of these optical devices can now be fabricated as a single integrated

circuit. Although in early tests only a small number of optical devices have been put on one chip, researchers expect to be able to produce highly integrated optical circuits. When fabrication tech-

niques for these "photonic" circuits are perfected, it will be possible to mass-produce optical ICs, just as electronic integrated circuits are today.

Optical switches have also been creat-

ed, using gallium arsenide in conjunction with aluminum gallium arsenide. With optical switches, individual light beams can be redirected, so that the light from each laser can be sent to any detector. These optical switches, known as "directional phase couplers," have not yet been fabricated as part of a larger optical integrated circuit, although putting them on the same chip with other optical devices is not expected to be difficult. But until this is proven, optical integrated circuits are missing an important device.

One possible use for gallium arsenide optical integrated circuits would be a completely "photonic" computer that uses photons (light) instead of electrons. Theoretically, all the logic needed for a computer could be performed with photons. But so far, research on pure photonic or optical computers has been inconclusive. They may prove to be useful in very specialized signal-processing applications, although a photonic general-purpose computer seems unlikely.

Merz suggests that a better way to exploit the integrated optical circuits would be to use them in conjunction with traditional electronic integrated circuits. Since gallium arsenide works well for both high-speed electronics and optical circuits, it may even be possible to use a single wafer of gallium arsenide for both types of circuit.

#### A Tough Problem

Another approach would be to use a combination of silicon and gallium arsenide, with silicon used for most of the electronics, and gallium arsenide for high-speed electronic components and for optical devices. However, growing gallium arsenide on a silicon substrate is a very tough problem that hasn't been solved so far. Merz says that other researchers are making progress in getting gallium arsenide and silicon to coexist, and he thinks the pure gallium arsenide approach and the combined silicon/gallium arsenide solutions may both work.

Using both optical and electronic circuits makes sense, since each technology can do what it does best. Highly developed, well-understood electronic integrated circuits would continue to be used for processor logic, memory, and related

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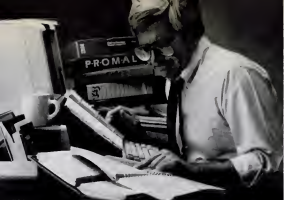
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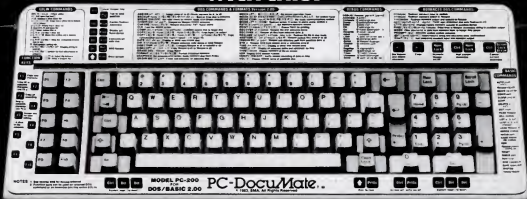


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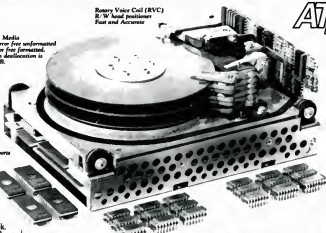
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You didn't buy an IBM PC-AT just to balance your checkbook. You bought it to crunch lots of numbers and words, in the shortest possible time. A labor saver. A time saver. Hence, a money saver. So, do your part for effective money management; hard disk storage is no place to be penny-wise and pound foolish.

### TELL 'EM YOU NEED HIGH SPEED AND DATA PROTECTION.

These and other important features do add cost, but that makes a premium drive.

Anything that can be made, can be made cheaper, sell for less, offer lower performance, and probably die young.

Remember, usually you get what you pay for, and you ALWAYS get what you don't.

**ALL HARD DISKS  
ARE NOT CREATED EQUAL.**  
There are vast differences in the speed and reliability of Winchester hard disks. Since the IBM PC-AT is an incredibly fast machine, a slow drive can make an AT run like an XT.

So, before you get stuck with a slow drive in your AT, save your boss two grand and buy an XT.

Or better yet, buy the AT and avoid any drive with Access Times over 40 milliseconds.

### RELIABILITY: WHERE HAS ALL THE DATA GONE?

Now tell 'em the drive must have a data protection scheme. One that's easy to use and reliable. Winchester heads read and write while "flying" a few microns above the data surface. If the heads contact the recording media, you risk a head crash, and significant or total data loss.

So, even a fast drive without data protection is virtually worthless. Frankly, we'd rather sleep at night.

### BEWARE OF USER-DEPENDENT PROTECTION SCHEMES.

Some drives have a safe landing zone for the heads, but you need to call a separate program to send 'em there. If you don't call that program, and most folks won't, the heads in these drives ALWAYS land on data when powered down.

The slightest bump or vibration can move the heads, wiping out those data tracks. And the R-W heads can become contaminated, thus increasing the error rate, slowing down average access until the whole drive fails.

Consequently, those drives offer a very high risk of head crashes, a false sense of security, and little else.

What's your data worth? \$500? \$400? Specify AUTOMATIC data protection. ATplus has it. And it doesn't cost, it pays.

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Specify AUTOMATIC park and lock of the heads on power down.

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We believe that computers ought to serve people, not the other way around.

### BEWARE OF THE BARGAIN BAND-SCHLEPPER.

Avoid drives with inexpensive Band-Stepper positioner technology. These were pretty good way back in 1980, considering that's all anyone had. But by today's standards, they're inaccurate and very mechanical.

They waste time looking for the right track to read or write. And they're worth no more than the price you'll pay for 'em in more ways than one.

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## QUANTUM LEAP

functions. Optical circuits would provide high-speed communication among the electronic sections.

This hybrid electro-optical computer architecture would resemble an extremely fast local-area network squeezed onto a single 6-inch wafer of gallium arsenide. Electronic processing elements placed at various locations on the wafer would be connected with optical circuits. Tiny laser diodes—fabricated as part of the chip—would accept information from one processing unit and send it at the speed of light through optical integrated waveguides to detectors connected to another processing unit. This on-chip optical communications network would function as an extremely fast bus connecting major functional units.

### Segregated Circuits

One way this might be done would be to fabricate electronic circuits on one side of the gallium arsenide wafer, and put all the optical circuits on the other side. The main reason to segregate the two is that they may require different processing during fabrication.

Electronic signals generated on the top electronic layer would pass through the wafer on small "vias," quite similar to the plated-through holes on a printed circuit board. The electronic signals would control lasers and optical switches on the bottom. With optical switches, almost any network topology can be used to provide communication among the components.

There's no reason to stop after connecting electronic units on a single wafer. According to Merz, it should also be possible to connect separate wafers optically. Lasers on one wafer would beam light to detectors on an adjoining wafer. The wafers could be arranged side by side, or stacked vertically, although right now it is much easier to build lasers that shoot light out the edge of the wafer than perpendicular to it. Obviously, getting separate wafers aligned properly so that the lasers on one wafer match up closely with the detectors on another is difficult, but theoretically at least on paper it looks like it can be done.

Before you start a savings account for that "cheap Cray," it's important to realize that optical integrated circuits only

solve some of the problems of making wafer-scale integration a reality. And don't forget that gallium arsenide is much more expensive than silicon. Besides, the silicon folks still have a few

more cards (or is that chips?) to play.

Anyway, I still want that Ferrari. And as for my computing needs, my motto is: "Give me a Cray, or give me . . ."—let's see—how about an AT? ■

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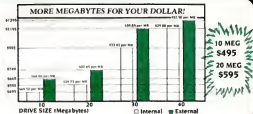
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drive and an Emerald subsystem with a 70, you can use all your storage as a single 90 MByte volume. Disk melding makes it easy to combine Emerald drives with each other or with your existing drive to get a subsystem with the storage capacity you need.

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## High performance 1/2" tape backup

**60 MBytes in 12 minutes is FAST** backup, but there's more. If your files are larger than 60 MBytes, Emerald's Backup and Restore Utility (BRU) software will automatically break your file into 60 MByte sections and prompt you for a new cartridge. Of course, restoring is just as easy.



Compact tape drive fits in the AT's front panel expansion space. 60 MByte cartridges are certified for high performance and supplied with color coded labels.



*Emerald subsystems were designed for the PC, AT and compatibles such as the AT&T 6300 and Compaq DeskPro.*

Menu driven software makes it simple, even for novices, to backup or restore exactly what is needed, and no more. Choose one or more files that were modified after a *Specified Date and Time*, one or more *Specific Files or Directories*, or *All Files and Directories* on a *DOS Logical Volume*.

**Restore data on a different micro** if you like. Backup up your company's Emerald subsystem in Portland, Maine and ship the tape to your office in Los Angeles. Because of the defect mapping technique used on Emerald hard disks, the subsystem in L.A. will import your data error free.



*Special defect mapping technique allows data to be restored on subsystems other than the original source.*

The BRU software automatically checks, and adjusts its, the defect map of every Emerald subsystem before restoring data to it.

CHADISK
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63536 bytes in 2 hidden files
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*Actual printout of CHA.DISK on 240 MByte volume.*

**You Determine** how many volumes exist in your PC, and what size they are. You can have as many as 24 volumes, and make each one exactly the size it needs to be.

Set-up is menu driven and as simple as "How many do you want" and "How big should this one be?"

**Integrate your existing hard drive** into your new subsystem. Emerald's Disk-Meld technology makes it possible for your XT's 10 MByte, or AT's 20 MByte drive to become part of a single large volume. For example, if you have an AT with a 20 MByte

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## Configured for today's Micros

The Physical Design of the Emerald subsystems lets you determine the configuration that will best serve your needs. Many of today's high performance micros have sacrificed expansion space in favor of compact size; others offer plenty of room for additional drives, tape units and expansion cards. Emerald subsystems provide you with the expansion ability you need. And, they're designed to allow you to continue to expand as your needs continue to grow. No matter which PC you have, there is an Emerald subsystem that will meet your needs.



*Subsystems are available for the PC, AT and IBM compatibles in a variety of configurations.*

**Internal Expansion** is easy on the IBM AT and XT. Emerald subsystems are pre-initialized and pre-formatted—just slide the tape or hard drive you have selected into one of the existing expansion areas, plug in a couple of cables, tighten a few screws and replace the system cover. Elapsed time: 10/15 minutes.

The AT accepts 280 MBytes or any single drive up to 140 MBytes and a 1/4" tape drive. The XT accepts any Emerald hard drive up to 140 MBytes in size, or the 1/4" tape drive.

**External and Portable** expansion is easy and practical with the Emerald Portable Subsystems. These IBM color-matched subsystems have their own power supply and are available with hard drives up to 140 MBytes in capacity or with a 1/4" tape drive.

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*"Expansion chassis" subsystem also provides 6 additional spaces to add cards to your PC.*

The 6 Expansion Slots in the Emerald expansion subsystems will be a welcome addition to many micros. If you don't have enough expansion room in your micro, or if you've used every available slot, then one of these subsystems is just right for you. They are closely matched to the IBM PC in size and color, and have their own, built-in, power supply.

Expansion subsystems are available with drive sizes to 280 MBytes in capacity, with, or without, a built-in 1/4" tape drive. When coupled with an AT a truly powerful computer system results.

## The real backup procedure

**Standing Behind You** all the way in the company that broke the 32 MByte DOS barrier.



*Documentation, host adapter card, software and cables are included with each subsystem.*

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If your company fits one of those categories, or, if you're a smaller company with an application you thought could only be done on a mainframe or mini, pick up the phone. Call Emerald. An Applications Engineer is standing by to answer your questions, send you literature and refer you to an installed site in your area.

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# The Digitization Of Everything

On our level of perception, the universe is analog; the electronic revolution is about the ability to digitize everything from music to color TVs. But what is the universe really? Analog or digital?

**G**ive me a place to stand," boasted the great Greek philosopher and inventor Archimedes in praise of his beloved high-tech lever, "and I will move the world." If he were around today, Archimedes would probably take one look at a computer, exclaim "Eureka!" and shout, "Give me enough memory, and I will digitize the world."

Computers and the people who perform wonders with them have made it possible to transform almost anything you can think of into the discrete units of binary digits—ones and zeros, on or off. They've had to: computers are wonderful, but they still think exclusively in binary. More than anything else, the electronics revolution is about the ability to digitize everything under the sun—not to mention the sun itself.

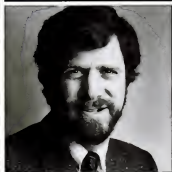
## Digitizing the Lever

With a little effort, an electronic-age Archimedes could even digitize his beloved lever. Like most things natural or mechanical, the lever is essentially what we've come to think of as an "analog" device. It isn't limited to a finite number of positions; fix one end, and you can put the other one up or down or anywhere in between.

To digitize the lever, simply decide how many discrete positions you'll permit the free end. Two positions—up and down—undoubtedly wouldn't suffice; a million would be more than you would need. But ten thousand points might do; express them mathematically (and thus ultimately in binary digits), and digitiza-

tion is essentially complete.

Silly? Probably, unless you happen to want to control that lever precisely from afar or simulate what will happen when you try moving the world with it from the space shuttle.



Stephen Manes

## Let's Get Digital

The impact of this kind of digitization on our lives has been stealthy and inexorable. You balance your checkbook with the help of a digital calculator and remember dimly if at all that analog relic, the slide rule. Your TV set, your VCR, your stereo, and your telephone are probably controlled by microprocessors that recast the real world into a binary one. Chances are excellent that your watch has no hands.

And digitization is at work in processes that seem unlikely. The automobile, that avatar of continuous motion, seems a poor candidate for digital control, but

that engine can easily be reduced to a digital model: Admit a metered mixture of air and fuel, trigger the spark plug to explode it at the right moment; repeat ad infinitum. Variables such as temperature, difficult to measure mechanically, can be tossed into the model. Thus modern ignition and fuel systems are controlled precisely by microprocessors instead of by analog mechanical devices subject to wear. It's a big improvement—until you need an ignition chip for your DeLorean in Moscow, Idaho.

## Can You Digit?

Automotive functions are excellent candidates for digitization because they involve a relatively few important variables with a relatively limited range at each instant. As a situation becomes more complex, digitization gets harder.

Harder, yes; impossible, no. Visual images, for example, present a seemingly unlimited range of color and light. Yet plain old photography as we know it is essentially a digital process: either an individual particle of silver halide gets hit by an individual photon or it doesn't. Shading is accomplished by averaging millions of particles. Three such emulsions stacked atop each other are all it takes to capture the whole range of color.

Given a fine enough electronic "emulsion" and a ton of memory, there's no reason digital imaging couldn't work this way, too. But the fact that such a thing is a long way from existence hasn't slowed anybody down.

Digital techniques have been used in television for years, and they've been re-

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## COMPUTERS IN SOCIETY

fined down to the chip level. Video disks are entirely digital, yet they deliver just about all the fidelity theoretically possible with current broadcast television standards. New digital TV sets just reaching the market can display one picture within another—just the ticket for combining MTV with 1-2-3.

But nobody would accuse broadcast television of producing photographic-quality images. High-resolution graphics extract a fierce memory overhead. Fierce, but not unmanageable: Computer-controlled laser-driven typesetting machines routinely produce output with 1,000-dot-per-inch resolution. Digitized that way, this page can be expressed in a mere 11 million bytes of memory—less than the theoretical maximum addressable by the AT's microprocessor. Add a few thousand colors, though, and things begin to get out of hand.

The major limitation to digitization comes in trying to change an enormous amount of data in a hurry. Microprocessors just aren't up to doing movie-quality high-resolution animation on the fly. Moving millions of bytes at once requires sophisticated algorithms and supercomputers, so don't expect real-time simulations of the weather system on every acre of the world, overnight.

Still, there's plenty that can be done in real time. Voice storage systems for the lowly PC have no trouble digitizing reasonable facsimiles of human conversation and turning them into PC disk files. Digital audio disk players transform sixteen bits of information 45,000 times a second into exceptionally complex and noiseless audio waves.

### Is It Live, or Is It Digital?

But the question of whether that waveform is truly realistic at all is where debate about digitization-as-reality begins. Analog systems actually recreate the very waveforms of the music, however imperfectly. The digital method produces only sampled instants and more or less fudges the gaps in between. Although most listeners consider Compact Disks the greatest thing since the Victrola and 78 rpm's, some self-proclaimed "golden ears" insist that they're able to detect a certain graininess produced by

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## COMPUTERS IN SOCIETY

the minute digital discontinuities.

How such discontinuities are handled may spell the difference between success and failure for a digital system. The important consideration is usually how many discrete gradations are needed to give the appearance of seamlessness.

My favorite controls on the IBM PC, for example, are the only ones that aren't digital: the brightness and contrast knobs on the monitor. Using them is as simple and intuitive as using a faucet: turn clockwise for more, counter-clockwise for less, and stop anywhere you want along the way.

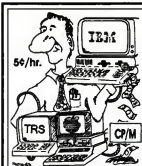
These knobs will undoubtedly be "improved" with digital control. That may mean you'll have to tap or hold down a button to adjust each control, and "just right" may not be an option. The digital volume controls on my stereo receiver and TV set give me about thirty positions—every one "too loud" or "too soft."

Such evident discontinuities can be avoided with careful design. Pressing the brightness control, for example, might activate a gross adjustment; simply tapping it could let you home in with more precision. Moreover, digital monitor controls could let you store preset levels for morning, afternoon, and evening light. The switches could even be monitored by your computer, whose software might turn up the brightness to eye-popping levels to warn you when you're about to do something truly stupid.

### By Remote

You might even be able to control the screen from across the room. One of the major advantages of digitization is the potential it offers for control of all sorts, especially the remote variety. If you want your toast dark every Monday to reflect your black workday mood and light on Sunday to avoid interfering with your hangover, you need a digital toaster with a VCR-like "multiple-event" timer.

If such a device isn't made at the moment, you can bet it will be. There are already microprocessor-controlled steam irons designed to shut themselves off before they scorch your shirts, and a reliable source informs me that there's a digital refrigerator that talks to you. What it



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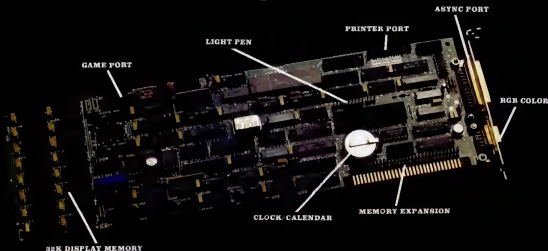
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## COMPUTERS IN SOCIETY

could possibly say that's useful, short of "you're out of beer," is difficult to imagine. But if manufacturers began to standardize on this sort of thing, you might eventually get an interface allowing you to control everything you own from one pocket-size keyboard, even over the phone.

### The Analog Revolution

Despite the wonders of digitization, humans still seem to be far more comfortable in the familiar analog world. Like old-fashioned faucet handles, rotary knobs are reassuring. There's no mystery about how they're going to work. Replacing them with nonstandard interfaces often introduces confusion and consternation.

What's more, digital precision is often overkill. Who cares if you're going 77.78 mph? When you glance down at the speedometer, all you want to know is whether you're just over the de facto Massachusetts speed limit. The supposed accuracy may be imaginary anyhow: Given the difficulty in measuring a runner's stride length, the unambiguous numbers on a digital pedometer must be taken with a grain of electrolyte.

Ultimately, digitization is probably leading us to an analog revolution. Look at the increasing replacement of hopelessly digital cursor keys by the first general-purpose analog computer device in a long time: the mouse. Observe the wave of new products digitizing another form of analog input: the human voice. Listen to the output of the all-digital disk: crystal clear music. And note the latest fashion craze: the cheap microprocessor-controlled watch with the analog face.

Using digitization to replicate the analog world may ultimately be the sincerest form of flattering nature. On our level of perception, the world is analog—muscle, bone, brain. But way down deep, it's just protons, neutrons, electrons, and subatomic particles. That may not be quite binary, but it sounds pretty digital to me. ■

*Author and screenwriter Stephen Manes has written more than 20 books, including the forthcoming Encyclopedia Place-matica (Workman).*

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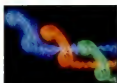


# CORPORATE COMMUNICATIONS

*Business users are always looking for faster connections and simpler software, and both can be found in the latest crop of modems, gadgets, communications programs, and electronic mail services.*



No set of features remains the standard for long in the telecommunications marketplace. In this issue, *PC* focuses on the latest advances. Microsoft and Microstuf are introducing a new group of "standard" features with their latest releases, *Access* and *Crosstalk Mark 4*. On the modem front, we look at three 2,400-bps modems borrowed from the mainframe world with features and flexibility that their PC counterparts can't match. Next, step into the world of Black Box Corporation, preeminent manufacturer of hardware solutions to communications snags. We'll also take a look at electronic mail systems to put your PC in touch with your clients or colleagues. Which service should you trust? We'll help you decide in the following pages.

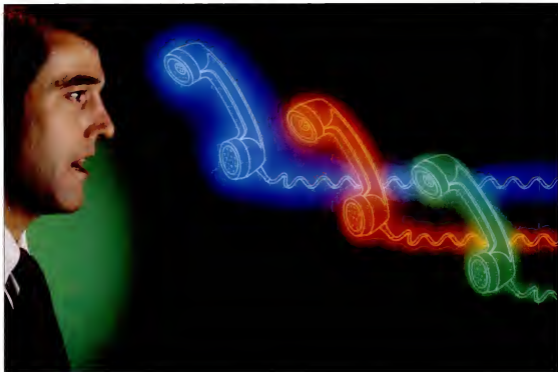


## CROSSTALK MARK 4 AND ACCESS

# REDEFINING THE STATE OF THE ART

*PC Magazine takes its first look at two brand new communications programs, Microsoft's Access and Microstuf's Crosstalk Mark 4.*

*Together, they establish a new tier of features and performance standards for communications software.*



**T**he absence of snap and sizzle in the communications software marketplace has not been due to a lack of competition. During several months of 1984, new communications packages were announced at the barely believable rate of about one a week. Yet three products—Andrew Flugelman's *PC-TALK III*, Hayes's *SmartCom II*, and Microstuf's *Crosstalk XVI*—seemed to satisfy the majority of users, with *Crosstalk XVI* leading the pack. New communications releases did not offer new or revolutionary features to woo users away from their familiar standbys.

Now, two new communications programs are bringing the market to a boil: Microsoft's *Access* and Microstuf's *Crosstalk Mark 4*. These two packages are currently the sole representatives of a new, more highly developed third tier of communications software.

#### A Software Evolution

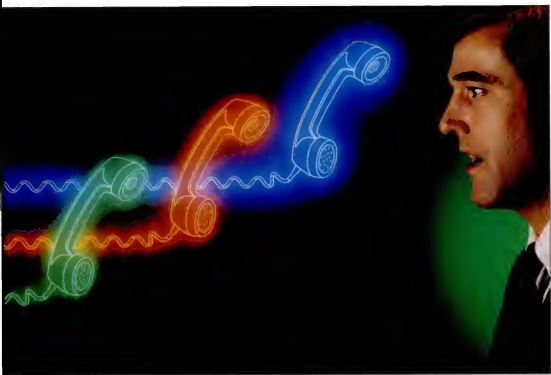
The original *Crosstalk* communications package was designed for 8-bit computers using the CP/M operating system. When the IBM PC hit the scene, Microstuf designed a completely new version of *Crosstalk* in assembly language to take advantage of 16-bit processors. The move from *Crosstalk* to *Crosstalk XVI* was as dramatic and meaningful as the evolution in spreadsheets from *VisiCalc* to *1-2-3*. As a matter of fact, *Crosstalk XVI* shares several features with *1-2-3*, such as large help files, simple commands derived from menus, the ability to save and recall templates or overlays, and an internal programming language.

*Crosstalk XVI* defined the state of the art in microcomputer communications programs for a couple of years. But now the team from Atlanta has developed a completely new communications pack-

age, *Crosstalk Mark 4*. *Crosstalk Mark 4* does not replace *Crosstalk XVI*—Microstuf will continue to market the successful *Crosstalk XVI* for users who don't need all of the features of the new program.

Together, *Crosstalk Mark 4* and *Access* establish a new standard for features and capabilities of microcomputer communications software. They may have even outdone the precedents set by *Symphony* and *Framework* for flexible interfaces and user interaction.

Features that separated the best communications programs from all others in 1984 are now standard in new releases: autodial, on-screen help files, macros, protocol file transfer, and capabilities that allow users to capture received data, see a directory of the files on a disk from within the program, pause between lines or wait for a prompt, perform a file transfer with an error-detection and retransmission protocol,



set parameters, put a variable-length pause between characters during transmission, and transmit files directly from disk. More than 40 commercially marketed microcomputer communications programs offer these features.

#### The Nice-to-Have Stuff

A much smaller pool of programs can perform the next level of functions, the *nice-to-have* communications features: auto-answer control, direct command and menus that can be used interchangeably, emulation (see sidebar on emulation), a programming language (see sidebar on script files), and more file-transfer protocols (see sidebar on protocols). In a way, they are similar to the features separating the 1-2-3s from the *VisiCalc*s in the communications arena. The simpler programs still run and, in fact, would be considered very useful if they were all that was available. But when better mousetraps with new features come along, the old mousetraps sit on a closet shelf.

These characteristics are typical of communications programs developed especially for the IBM PC instead of those just warmed over from 8-bit environments. *Crosstalk XVI* offers all of these features; *SmartCom II* and *PC-TALK III* have most of them.



#### Access

Microsoft Corp.  
10700 Northrup Way  
Bellevue, WA 98004  
(206) 828-8080  
List Price: \$250

Requires: 256K RAM, two double-sided floppy drives or hard disk, DOS 2.0 or higher.

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#### Crosstalk Mark 4

Microstuf  
1000 Holcomb Woods Parkway  
Roswell, GA 30076  
(404) 998-3998  
List Price: \$245

(Crosstalk XVI upgrade: \$50)

Requires: 256K RAM, one floppy drive, DOS 2.0 or higher.

CIRCLE 630 ON READER SERVICE CARD

#### Simultaneous Sessions

The new wave of communications software, represented by *Access* and *Crosstalk Mark 4*, is finally sending out ripples of change. The most revolutionary shift is the ability to conduct more than one communications session at a time. Both programs allow you to use the X-PC protocol to connect to several host computers simultaneously through a packet-switching network, such as Tymnet. With the X-PC protocol, you can exchange data with up to 15 computers connected to Tymnet at the same time. With *Crosstalk Mark 4*, you can have 15 separate communications sessions active at once. *Access* allows 8 simultaneous sessions.

While this capability may be revolutionary, its practical application is limited. Right now, it is hard to imagine why you would want to talk to 15 computers at once. Most people are probably going to want to use X-PC with a carrier, such as Tymnet, to access 1 or perhaps 2 host computers at a time. Yet because the ability is available, new uses will certainly emerge to fill it.

Both *Access* and *Crosstalk Mark 4* let you run simultaneous communications sessions in separate on-screen windows. You can download information from CompuServe in one window while composing a message on MCI Mail in another. But programs that allow simultaneous work to take place in separate windows on the screen share a problem: when you have more than one window, you don't see a full page of data. Depending on how you split the screen, whether horizontally or

vertically, each window gives up either lines of text or columns of characters. If you can command the host computer you are working with to send text in a 40-column mode or to put only 12 lines in a page, you can comfortably use windows to show two simultaneous communications sessions. But if you have three or more sessions going on in separate windows, you will probably miss something.

*Crosstalk Mark 4* gets around this limitation by placing each communications session on a separate full-screen page, only one of which is visible at a time. You can alternate between different pages by using the Alt key and a number. This process is almost identical to the way Microsoft's *Windows* operates so you have to wonder why Microsoft's *Access* program doesn't do the same thing.

*Crosstalk Mark 4* and *Access* also offer another multisection ability that may be more valuable than the X-PC protocol in some situations. Along with the ability to establish simultaneous X-PC sessions through one communications port, both programs let you use two different communications ports on the PC to conduct simultaneous sessions. For example, you could have a direct RS-232C connection to a local multiuser minicomputer on COMM:1 emulating a DEC VT-100 terminal while COMM:2 is in a modem session swapping DOS files with a PC across the country. The two sessions would function independently. You can, however, save data from one session in a file and then transmit that file out as a part of the other session.

### STATE-OF-THE-ART FEATURES

	Access	Crosstalk Mark 4
Multisession (number)	8	15
Full-Screen Pages	no	yes
Kermit	no	yes
Link Protocol	X-PC	X-PC, MNP
On-Screen Windows	yes	yes
Conditional Statements	yes	yes
Math Variables	yes	yes

Among the benefits of the new wave of features offered are the ability to hold multiuser sessions and conditional statements that make automated sessions run more smoothly.

The increasing popularity of private branch exchange (PBX) telephone systems that carry both voice and data will make the multiple port capability of *Access* and *Crosstalk Mark 4* a very valuable feature. You can have multiple X-PC sessions active through one communications port and simultaneously communicate through the PBX to local computers on the other port.

#### Protocols

Besides letting you engage in multiple communications sessions, X-PC also checks all data transmitted between any two machines for accuracy. Both *Access* and *Crosstalk Mark 4* also include the Xmodem protocol, which checks blocks of data for accuracy when files are being exchanged and either sends or requests the name of the file being transferred. Xmodem is used on many bulletin board systems, and it is available in many brands of communications software. The accuracy-checking portions of Xmodem and the *Crosstalk* file-transfer protocols would be redundant if you were operating over an X-PC-to-X-PC link, but the file-naming and file-handling functions would still be useful.

*Crosstalk Mark 4* also includes the Kermit protocol, often used to exchange files with mainframe computers, and the MNP link-level protocol used by Telenet and Uninet. MNP does not have multisession capability, but it does provide good full-time error detection and on-call file transfer abilities. Columbia University distributes Kermit as public-domain software, and it is widely used for micro-to-mainframe links in universities and in government. MNP was developed by Microcom, but the company licenses it to many other companies.

#### Script Files

Both *Crosstalk Mark 4* and *Access* include internal programming languages that allow you to write scripts of commands for the program to follow. Earlier communications programs have this feature, but these two products reach new levels of versatility in applications programming languages. In *Crosstalk XVI*, for example, you can write script files that instruct the program to perform a series of steps. If all

of the responses from the host computer are correct and the communications line is error-free, then the scripted session goes automatically.

But *Crosstalk XVI*'s script language doesn't contain enough conditional statements or the ability to test received data to handle uncommon situations. Therefore, a *Crosstalk XVI* script is liable to hang up (both in the computer and telephone sense

of the term) when it receives unexpected data. The very capable new command languages in *Access* and *Crosstalk Mark 4* are full of conditional statements and tests for data.

The command languages of the last generation also were unable to do much in the way of calculating. These new script languages have full floating-point math capability. *Access* and *Crosstalk Mark 4* can



The X-PC protocol allows both *Crosstalk Mark 4* (top) and *Access* (bottom) to conduct simultaneous sessions with more than one active window.

capture numbers as they are received from a host, compute values based on formulas you write, and perform functions based on the results of these calculations.

For example, you could write a program entirely in either the *Access* or *Crosstalk Mark 4* command language that would

automatically call up the Dow Jones/News Retrieval access number, log you in with your password, request current prices and histories for certain stocks, compute the stock's gains and losses, and then call a broker with either buy or sell orders, depending on the results.

The flexibility to use branching, loops, strings, and other powerful programming expedients in script language means you can design customized scripts for yourself and others that automate communications sessions and can handle unexpected situations.

## TERMINAL EMULATION: HOW IMPORTANT IS IT?

*If your communications software doesn't emulate a terminal your host computer can relate to, you might as well be using a Teletype machine.*

When computers were comprised of vacuum tubes and clacking relays, the Teletype machine was the most common type of computer terminal. A teleprinter operates like a typewriter: the newest information appears on the bottom line and the page scrolls up as you add new lines. Cathode ray displays gradually replaced the printhead, but information was often still printed on the screen from the bottom up.

IBM pioneered the use of terminals that painted information on many parts of the screen in displays for military applications. As the availability of integrated circuits increased, it became practical to use some intelligence in the terminal to help place and vary the display of information on the screen.

Hard-wired logic and eventually microprocessors were placed in display terminals so that the computer could send special instructions called control codes, concerning the way information was displayed on the terminal. Control codes carry commands to move the cursor around the screen, change the intensity, create special effects such as blinking, and control printers and other devices attached to the terminal.

The use of control codes to create screen displays is practical because you update only the data that changes. The rest of the screen can remain unchanged and the communications workload is reduced. Control codes are also valuable because they make it easier to design

screens that call the terminal user's attention to special displays or actions. Many programs running on mainframes and minis were written with the expectation that a certain kind of terminal would be used as a display. The operation of the program may be closely tied to the structure and display of the input screens and program instructions.

Unfortunately, ANSI and other standards used for the interpretation of control codes vary widely, but the manufacturers control the market through their practices. More IBM 3270 series terminals have been sold than any other single type, but their complex display and printer control scheme varies even between terminals in the model line. The DEC VT-100 is probably the most widely used non-IBM standard terminal, and most UNIX software is written for it, but many other companies have strong competing products.

If you use your microcomputer to communicate with a larger computer through a modem or by direct connection, the host system will probably expect the micro to react to control codes like some particular type of commercial terminal. If the microcomputer being used doesn't respond to these control codes properly, the screen display may be useless. Communications software handles the emulation of a particular kind of terminal on a PC.

Many terminals have more or different display capabilities than are available

with the PC's hardware. The VT-100, for example, can display double-high and double-wide characters, and it can squeeze 132 characters onto a line. The keyboard has different keys and special control over the printer port.

The way the communications software makes up for the PC's differences and limitations is an important factor in determining its usefulness. If the author of the communications software didn't find some way to work around the PC's display limitations, you might miss valuable data.

Both *Access* and *Crosstalk Mark 4* can emulate the VT-100 and a subset of the VT-100, the VT-52. *Crosstalk Mark 4* displays 132 characters by horizontal scrolling, while *Access* is limited to an 80-character display. The new *Crosstalk* can also emulate the IBM 3101, ADM-3A, ADDS Viewpoint, and several different TeleVideo terminals. The code to perform an emulation task is a separate module in *Crosstalk Mark 4*. You can leave those emulators that you don't want off the working disk and add new or customized emulations. All of the emulation code for *Access* is in the main program.

If you only intend to communicate with other PCs and bulletin board systems, you will probably never need terminal emulation. But if mainframes or minis will be your hosts, emulation should be an important factor on your capabilities checklist.

—Frank J. Derfler, Jr.

## Looking at You

*Access* and *Crosstalk Mark 4* present a friendly face to the user. They both allow you to select a function from a menu or enter a command directly by typing a few characters. When you start using either program, you can use the menus to select

the functions you want. Once you become familiar with the program, you can bypass the menus and directly enter commands. You can move around on the menus in both systems with a mouse or with the keyboard arrow keys.

Both programs allow you to change

colors of windows, add borders, and do all the standard windowing functions. They contain context-sensitive help files that respond with different help screens according to the job you are engaged in when you call for help.

*Crosstalk Mark 4* and *Access* both run

## SCRIPT FILES MADE EASY

*The programming languages in Access and Crosstalk Mark 4 let you write sophisticated programs to guide your communications sessions.*

Many people have tried to create a fully automated communications session, but few have been successful. It's a difficult task, simply because of the number of things that can go wrong during a session and change between sessions.

Several programs, such as *Crosstalk* and *ASCOM*, include command languages that let you create script files containing lists of commands to be followed. Scripts created with either the *ASCOM IV* or *Crosstalk XVI* command languages allow the programs to call a number, recognize a prompt from the host, send sign-on and password codes, transfer files using a file-transfer protocol, end the session, and hang up the telephone line. But if the prompt from the host computer changes or if the line is garbled, the program might halt and leave you accumulating expensive connection time while no work is being done.

These command languages were designed to build scripts for sending or receiving information, but they can't make programs act on the information they receive. They mainly contain communications commands, with few language or conditional commands that allow branching or looping. The scripts can tell the communications program to look for a certain string of characters and send a stored reply, but they can't manipulate and evaluate received data.

Microsoft's *Access* and Microsoft's *Crosstalk Mark 4* include programming

languages that allow you to write sophisticated and flexible programs to guide communications sessions.

The *Access* programming language, known as Microsoft Access Script Commands (MASC), has strings and command statements that are like BASIC, but the resulting programs are structured like C programs. MASC contains several types of conditional statements, including IF, THEN, ELSE, and CASE. If you are familiar with the syntax of BASIC, you shouldn't have any difficulty writing programs in MASC.

*Crosstalk's* command language looks like English. Its many conditional statements have names such as JUMP, SKIP, and WHEN. The syntax is not strict and the same command can be stated in several different ways. You can write a statement in *Crosstalk's* script files such as, WAIT UP TO 10 SECONDS FOR "SIGN-IN" or WAIT 10 "SIGN-IN" and the results would be the same. Because the program can link multiple words to a function, you can use it to add non-English words and synonyms to the command list. In just a few seconds, you can teach *Crosstalk Mark 4* that STAVIT, HALT, BASTA, ARRETEZ, and WHOA, all mean STOP, and the program will make these words a permanent part of its command list.

Both *Access* and *Crosstalk Mark 4* can watch the keystrokes you use to initiate a communications session, record the responses from the host, and write a pro-

gram file to duplicate the results. This LEARN command can reduce the burden of writing automated program files. You can use either program's learn mode to create an initial file and then edit or add to it to increase its flexibility.

### Programs Within Programs

You might get more ideas for using the languages in *Crosstalk Mark 4* and *Access* if you think of them as programming languages with communications functions. Because the *Access* and *Crosstalk Mark 4* languages include conditional statements, have good string-handling abilities, and can perform mathematical functions, you can write applications programs within communications programs that can react to the characters received from the host. The communications aspect of these applications may be almost secondary.

Both programs are capable of reading the system clock and starting their functions on any date at any time you specify. After they connect to a host, they can look for specific words, capture numbers and manipulate them, and take follow-on programmed actions, just as if those words and numbers were coming from the keyboard.

*Access* and *Crosstalk Mark 4's* powerful internal languages let your computer do the job of communicating, leaving you more time to think about the information you receive.

—Frank J. Derfler, Jr.

## OTHER SOFTWARE OPTIONS

*You can't have simultaneous access with ASCII Pro, MEX-PC, and ASCOM IV, but all three programs will automate your communications systems.*

**A**ccess and Crosstalk Mark 4 are creating a big stir, but not everyone needs all the power they have to offer. Three new communications programs, *ASCII Pro*, *MEX-PC*, and *ASCOM IV*, don't have the fancy multisession capabilities of *Access* and *Crosstalk Mark 4* and don't do windows, but they all accept some kind of internal programming to automate communications functions.

### ASCII Pro: Calling All Apple Users

Past and present Apple users who've used *Z-Term Pro*, *P-Term Pro*, or *ASCII Express Pro* on the Apple will feel right at home with *ASCII Pro*. The commands are the same, and the appearance of the program on the screen is very similar.

*ASCII Pro* features a menu-driven format and context-sensitive help screens. Special submenus are called from a main command menu. After you get to know the program, you can string together single letters representing the options on each menu to prevent the submenus from being displayed.

*ASCII Pro* incorporates almost all of the basic and nice-to-have features of modern communications software. It accepts three generic types of commands: file handling, data/buffer control, and utilities. File-handling commands transmit and capture files and work with the disk drives (only the Xmodem file-transfer protocol is available). The data/buffering controls allow direct capture of data to disk and transmission from disk files or RAM.

The utilities include the ability to emulate many common commercial terminals and to create macros of characters, *ASCII Pro* commands, or commands for the host computer. You can automatically or manually execute these macros. The macro statements are, however,

very terse and don't make much sense when you look at them unless you have a good working knowledge of the *ASCII Pro* series. The macro language has fewer conditional statements than the script languages in *ASCOM IV* and *Crosstalk XVI*, however, and is less intuitive.

Advanced DOS users will appreciate some of *ASCII Pro*'s finer points, such as the ability to use the DOS 2.x ENVIRONMENT commands, which set variables that applications and batch files can reference. *ASCII Pro* uses this buffer by looking in it for a definition of a pathname where its support files can be found. This means that you don't have to copy the program and all of its files into every subdirectory on a hard disk to use it.

*ASCII Pro* was written by people with a lot of experience in communications products. It is professional and capable and should particularly appeal to people familiar with the United Software's *Pro* series of programs on other operating systems.

### MEX-PC: Practical Power and Price

*MEX-PC* (*MEX* stands for "modern executive"), distributed by NightOwl Software, has a list price of \$59.95 and includes the commonly used communications abilities plus a few surprising additional features.

*MEX-PC* is only command driven. It has no menus, but help screens are available. The program will transfer files using the Modem-7 (Xmodem) file-transfer protocol and emulates the Lear Siegler ADM 3A terminal in standard operational mode. *MEX-PC* is one of the few programs that also includes the CompuServe "A" protocol for downloading CompuServe files.

*MEX-PC* also has the unique ability to redefine every key on the keyboard

without running any additional utility programs. Key definitions can be virtually any length, from a single letter or number up to several lines of text.

Most programs in *MEX-PC*'s price range can't execute commands from an internal script, but *MEX-PC*'s command processor can read a list of sequential commands from a disk file you create with your own word processor. This command file can contain any of *MEX-PC*'s valid commands, which are created from a list of 40 command words. Three types of commands are included in these files: *STAT* commands to set *MEX-PC* for a particular type of session, *DIAL* commands to actually dial the calls, and *SENDOUT* commands to send the host strings, such as sign-on and password.

*MEX-PC* is not an inexpensive program for beginners. Rather, it is an inexpensive program for practical communicators who want to get the job done with a minimum of cost and overhead.

### ASCOM IV: Competent Power

*ASCOM IV*, the latest member of the family of communications products by DMA, offers a powerful command language processor and a long list of communications options. This full-power communications program can meet the needs of both novice and experienced communicators. In fact, the *ASCOM IV* manual comes in two parts, general and advanced.

*ASCOM IV* has a series of menus that make use of the PC's function keys in a system that is a little less intuitive and more mechanical than most of the other new communications programs. A direct command mode is available as a menu selection, but you can't easily mix direct commands and menu selections.

A good selection of terminal emula-

tions is available in *ASCOM IV*, including TeleVideo 912, ADDS Viewpoint, ADM-3A, and VT-100 (but not the VT-100 132-column mode). *ASCOM IV* performs error-checking file transfers using the Xmodem protocol and a unique *ASCOM IV* protocol.

The *ASCOM IV* programming language contains eight categories of commands: computational, communications, configuration, DOS, file I/O, mode, and screen and printer controls. The computational commands are simple, consisting mainly of counting routines used to keep track of the time and the number of data exchanges. The communications commands direct certain actions that would be used during a communications session. Configuration commands set the baud rate, terminal emulation mode, and other factors. The file I/O commands are more comprehensive than those in other programs of this type. You can manipulate character strings and read and write specific strings to and from files.

Another useful feature of *ASCOM IV* that isn't found in many PC programs is the ability to easily access and modify translation tables, which catch incoming and outgoing alphanumeric and control characters and, if appropriate, convert them to something the receiving system can understand. *ASCOM IV* will display a complete translation table on the screen and allow you to use the cursor keys to select an entry and then to type the character equivalent in hexadecimal.

You can use the translation tables to customize the program to communicate with computers or other digital devices that may not use the standard ASCII code. This kind of customization is pretty sophisticated work, but if you need this flexibility for unique applications, it is very valuable.

*ASCOM IV* is a full-featured communications program that can provide menus for novices or customized features for communications experts. It is a program you can grow with.

—Frank J. Derfler, Jr.

under Microsoft's *Windows* operating environment. Under *Windows*, you can put either program into a background mode where it will execute a script file and perform a communications session without ever being visible on the screen.

All of the potential uses for multisession automated communications have yet to be explored, but these two programs

have enough power to provide solutions to communications problems for both novice and expert users. Together, Microstuf and Microsoft have established a new level of performance to which other programs can aspire. ■

Frank J. Derfler, Jr. is a contributing editor for PC Magazine.

## KNOW YOUR PROTOCOLS

*New communications protocols do what all the old ones did and much more. X.PC and MNP are link-level protocols that offer very high levels of accuracy.*

Communications protocols, such as Xmodem and Kermit, guarantee the accurate transfer of data, but not all protocols work in the same manner. They differ in when they go to work and what other tasks they can perform.

X.PC, the new protocol used in *Access* and *Crosstalk Mark 4*, is called a link-level protocol. The link level, one of seven levels defined in the International Standards Organization Open Systems Interconnect model, works full-time on the link going between the two communicating devices. *Crosstalk Mark 4* also includes another link-level protocol, known as MNP.

In action, both of these protocols group the transmitted zeros and ones together into packets, make a statistical analysis of the packets, and transmit the result of the analysis to the receiving end. The X.PC or MNP software at the receiving end will perform an identical analysis of the received packet, and if the results don't match, it will request a retransmission. X.PC and MNP have very high levels of accuracy.

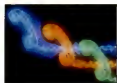
Both protocols can perform their link-level checking jobs only between PCs or between PCs and the communications computers in packet-switching networks such as Tymnet and Telenet. At this time, few mainframe computers are geared up to use X.PC or MNP directly, but the packet-switching networks are

well equipped to do the job for them.

Along with error-checking, X.PC also offers a unique multisession capability. Using X.PC protocols, the Tymnet packet-switching network can connect you to as many as 15 different host computers on the network at one time. Each X.PC packet is coded with an address showing which host computer it is destined for. The X.PC program in the Tymnet communications computer recognizes these addresses and properly routes each packet. Similarly, the packets coming to you from the various hosts are coded with the point of origin. The X.PC portion of *Access* or *Crosstalk Mark 4* sorts the packets coming in according to origin, and other portions of the programs display them in specific windows or in *Crosstalk's* full-screen pages.

### MNP File Transfer

The MNP protocol does not have a multisession capability, but it does take some of the work out of sending specific files between computers. Commands available in MNP-equipped programs allow you to specify the name of a file you want to transmit or receive. The program will follow the protocol and notify the other end of what steps to take to get the job done. The name of the file and its size will be exchanged, and the transfer automatically takes place when both sides are ready.—Frank J. Derfler, Jr.



# GOOD THINGS COME IN BLACK BOXES

*Sometimes all it takes is a simple hardware add-on  
to make PC communications as trouble-free as they should be.*

*The right "black box" can be a solution even when  
no problem is apparent.*



If you try to hook your PC into anything more complex than a genuinely IBM-compatible parallel printer or Hayes-compatible serial modem, you're likely to connect with nothing but frustration. The complexities of communications equipment are so varied, with so many different types of connections possible, that even the most experienced computer experts won't have encountered or anticipated them all. Worse yet, few off-the-shelf solutions are available, even for relatively tame problems, because most setups require specialized hardware.

However, there is hope: You can find hardware solutions for most PC communications problems. Best of all, experienced help is just a telephone call away—not from IBM, as you might expect, but from Black Box Corporation of Pittsburgh. Black Box is perhaps the preeminent

source of answers to computer communications problems. Its engineers are ready to answer your questions about computer communications, at no cost to you other than the expense of a long-distance call.

Of course, a profit motive underlies this effort: Black Box sells one of the widest selections of problem-solving hardware devices in the computer communications field. More often than not, one of the company's black boxes will solve your problem. Moreover, the match between problem and product is neither merely self-serving nor coincidental: Black Box developed most of its products by patiently listening to the needs and the pleas it heard at the far end of the telephone line.

To learn more about communications problem-solving hardware, which can range from the simple to the exotic, I met with Ken Shaw, vice president of engineering for Black Box. I discovered that a

simple hardware addition can often save you time, expense, and hardship. It can also cut your phone bills and installation costs as well as make your computer communications as convenient, trouble free, and affordable as they are supposed to be.

### A Profusion of Ports

Everyone has criticized one aspect of the original PC design or another. When it comes to communications, the first curse you utter will probably be about the absence of a sufficient number of serial ports—the primary two-way PC interface. No matter how many IBM asynchronous adapters you stuff into your computer's expansion slots, you can never operate more than two of them when you're running an

From Black Box (l. to r.): Statistical multiplexer, ABC switch, RS-232 protocol converter, print spooler, port selector.



application under DOS.

The serial port shortage stems from DOS rather than from your PC. DOS knows how to use only two communications ports, while your PC has built-in provisions to deal with four when using a more agreeable operating system, such as Xenix.

Admittedly, the DOS port-addressing limit can be conquered with a bit of imaginative program code. But even when you modify DOS to deal with all the serial ports of your dreams, if you use IBM's official one-port-per-slot communications adapters, you'll run out of room in your PC before you run out of communications ideas.

Expanding your serial horizons isn't difficult: All you need is a simple switch. According to Black Box, serial port switches are the most popular communications option it sells.

The basic serial port switch, which Black Box calls the ABC selector, simply stretches one port into two. To connect one of two serial devices to your computer, you manually rotate a knob. Using Black

Box's more elaborate switches, such as the ABCDE selector, you can switch between four serial devices with the twist of a knob. A more sophisticated criss-cross or X-selector alternates the connections of two inputs and two outputs. For instance, if you have two computers, a printer, and a modem, then one setting of the selector will connect one computer to the printer and the other computer to the modem. The other setting will connect one machine to the modem and the other to the printer.

Because these simple hardware selectors are passive devices that require no power and contain no circuitry other than a mechanical multi-pole switch, they do not alter your computer's communications signals. Rotating the selector does exactly the same thing as plugging and unplugging cables, although it's faster and won't wear out the connectors. However, you cannot just switch between two devices that require different communications parameters such as data speeds and word lengths. Unless you want to change the settings of your serial port with every switch setting, all the devices connected to the output of your selector must share the same parameters.

The prices of simple, hard-wired port selectors vary with the number of leads in the serial cable that are switched, usually from 4 to 25 (the full complement of a RS-232 cable) and the number of input and output ports. The simplest start at about \$75. Similar selectors are also available for switching parallel ports, coaxial cables, and even ordinary telephone lines.

"Active" port selectors are smarter and more versatile because they contain active circuitry, tiny computers inside that listen to and process the data carried by the serial cable coming from your computer. Most of these selectors are now also "code activated." When the port selector detects a control signal buried in the data on the serial line—generally an unusual combination of normal ASCII characters—it automatically selects a different output port.

You can send the necessary command codes to the selector by embedding the appropriate command characters in the data stream that is sent out through the serial port (perhaps by including them in a file that is to be printed or by adding them to the set-up sequence of many applications

programs). For instance, the majority of communications programs allow you to set your modem dialing sequence. You can preface the modem dialing command with the appropriate command switching

**U**sing IBM's official one-port-per-slot communications adapters, you'll run out of room in your PC before you run out of communications ideas.

characters to automatically connect the program to the right port whenever you use your modem.

Because the active circuitry inside such code-activated selectors can process your computer's communications signal as it travels to its ultimate destination, most of these selectors allow you to change communications parameters and sometimes the port types (either DTE or DCE) when you switch. As a result, you can attach a 300-baud (bits per second) modem and a 9600-baud printer to the same computer port.

Black Box offers a four-output code-activated switch for \$455. Other companies, such as Bay Technical Associates, Inc. in Bay Saint Louis, Mississippi, sell more elaborate models with up to 96 output ports.

Because most serial ports are two-way streets and pass data in both directions, most port selectors can work the other way and connect multiple PCs to a single printer. But Black Box has a pair of even better solutions for a printer-sharing poor man's network: the Printer Sharing Interface combined with the Multi-Port Spooler, which comes with buffers starting at 64K and up.

Both of these eager selectors constantly scan all four of their input ports looking for one with something to print. When the

## PC FACT FILE

### Black Box Corporation

P.O. Box 12800  
Pittsburgh, PA 15241  
(412) 746-5500

Technical Help Line: (412) 746-5565

List Prices (subject to change): Four-output code-activated switch (CAS-4Q), \$455; Printer Sharing Interface (PSI-4A), \$465; Multi-Port Spooler (with 64K buffer), \$649; 32-channel local multiplexer (MUX/LD-32), \$3,200.

CIRCLE 689 ON READER SERVICE CARD

### Bay Technical Associates, Inc.

Hwy. 603, P.O. Box 387  
Bay St. Louis, MS 39520  
(601) 467-8231

List Prices: Code-activated switches, contact company.

CIRCLE 690 ON READER SERVICE CARD

### Complex Systems, Inc.

4930 Research Drive  
Huntsville, AL 35805  
(205) 830-4310

List Price: Seven-channel statistical multiplexer (TX-7), \$1,495.

CIRCLE 691 ON READER SERVICE CARD

scanner finds a print job, it connects the printer to the appropriate port until the stream of data going to the printer ends. Immediately thereafter the scanner begins to look for something else to print. The Multi-Port Spooler also features a built-in buffer and has the ability to control either four inputs (computers) and two outputs (printers), or two inputs and four outputs.

#### Long-Distance Printing

Sharing a room with one of the more robust daisywheel or impact dot matrix printers can make a job like guiding jets into O'Hare International Airport seem quiet and appealing. Stretching a parallel printer connection beyond 10 feet or so is prohibited both by IBM and common sense. Long cables and high-speed parallel data don't mix. Go too far and your printouts may bear a proliferation of random misprints—if your printer works over long distances at all.

Serial connections can bridge much longer distances without confusion. However, that benefit is hardly enough to encourage you to rush out and buy a new serial printer. Owing to the pervasive IBM influence and the surliness of the typical serial machine, most printers today listen only through parallel ports.

Nonetheless, you can distance yourself from your printer in several ways. The first solution is to use a matched pair of parallel-to-serial and serial-to-parallel converters. These converters, which let you use all your PC's normal parallel printer functions without alteration, communicate with any IBM-compatible parallel printer even if it's hundreds of feet away and, incidentally, give you the benefit of cheaper wiring. (If you don't mind losing the use of a communications port or enduring the frustration of sorting out a serial connection, you can run a parallel printer from one of your PC's serial ports, using only a single serial-to-parallel converter.)

By itself, a parallel-to-serial converter can be a better way of connecting a serial printer to your PC than using specially wired cables and mode commands. Additionally, hooking a parallel-to-serial converter to your normal printer port saves one of your PC's all-too-few asynchronous ports for more-important matters and can eliminate the elaborate software rituals

needed to make everything work.

Often the joy of connecting a serial printer to a PC can only be compared to Chinese water torture—particularly when it comes to handshaking. Handshaking

means setting up the proper hardware or software controls so that characters are not lost if your PC's output outruns your printer's ability to digest data. Ordinarily, your PC uses hardware handshaking, though

## FRAMING AN ANSWER: SYNC VS. ASYNC

*Synchronous systems are faster and less susceptible to errors, but async systems are simpler, cheaper, and easier to design.*

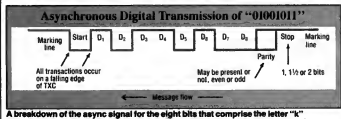
Within the realm of computers, synchronization means that the digital pulses of two or more systems march in lockstep: In other words, the transitions between logic levels (on/off or high/low) occur at exactly the same instant. The two ends of a synchronized or "synchronous" communications line know exactly when each pulse should occur, and the presence or absence of a pulse when one should occur codes information.

In asynchronous systems the two ends of the communications channel are essentially independent. The receiving end never knows exactly when the digital pulses that code individual characters will occur. Consequently, the beginning of each asynchronous character always has an extra bit, called a "start bit," that warns the receiving system when a character is being sent. Most asynchronous protocols also include one or more "stop" bits that define the end of each character.

Although a profusion of synchronous communications protocols exist, the two most popular are Binary Synchronous Communication (Bisync or BSC) and Synchronous Data Link Control

(SDLC). Both work similarly, coding data bits into a "frame," a lengthy data sequence that consists of several parts. The frame begins with a synchronizing signal that locks the communicating systems into step. Next, a header or address field is sent to identify the data and/or its destination. This is followed first by the information itself, then by error correcting information. While asynchronous communications puts only a single character between the start and stop bits, synchronous signals may send hundreds or thousands of bytes of data within a frame.

Asynchronous signals have several characteristics that make them attractive to personal computer designers. The circuitry is simple and cheap, and a whole system can be designed without a thought to what's connected to the other end. In general, synchronous signals are faster and less susceptible to errors; in fact, they're essentially error free. These characteristics make synchronous communications particularly desirable—despite higher hardware and wiring costs—for high-speed data communications in mainframe systems.—Winn L. Rosch



many printers prefer software handshaking instead, using either the XON/XOFF or ETX/ACK signal pairs. These handshaking protocols control the flow of characters that are sent out of the serial port. For example, if characters in a data stream are sent to a printer faster than the printer can handle them, the printer responds with the XON signal to alert the computer that it is sending the data too fast.

Although some applications programs have built-in controls for such printers and a few utilities add such abilities to DOS, none seems to work with all software at all times. However, one of the more versatile parallel-to-serial port converters can clear up the confusion, accepting hardware handshaking from your PC and sending the proper software signals to the printer.

#### Protocol Converters

Protocol means "an accepted way of doing things." For diplomats, it amounts to ritual; for computers, it's an accepted mix of connections, characters, and signals that can be understood at both ends of a communications circuit. As with human beings, when computer interconnections do not observe the right protocols, one or the other end of the circuit will think itself snubbed. The result is anything from open war and blackened circuit boards to obstinately inactive systems. Hence connecting a device that prefers one protocol to one that adheres to another requires an electronic goodwill ambassador called a protocol converter.

Strictly speaking, then, a parallel-to-serial printer adapter is a protocol converter. But protocol conversion goes well beyond such simple units to devices that allow you to connect your PC to nearly any computer or peripheral in the world—from digital thermometers to the most powerful mainframes.

The standard PC protocol is asynchronous communications through the de facto standard RS-232C serial port. Although different data speeds, handshaking, and wiring options turn the so-called standard into a communications confusion, certain characteristics, defined by the asynchronous nature of the signal, are always present, no matter what the mix (or mix-up) of parameters.

When you want your PC to talk to a

mainframe, you inevitably need to make it understand and speak synchronous signals (see sidebar). Consequently, a whole computer subindustry has sprung up to offer synchronous communications adapters that slide into a vacant expansion slot in your PC.

An effective alternative to the PC adapters inside the machine is the standalone protocol converter that changes

**C**onnecting a device  
that prefers one  
protocol to a device that  
adheres to another requires  
an electronic ambassador—  
a protocol converter.

asynchronous serial signals into whatever synchronous format you prefer. Since many standalone converters can handle several PCs at once and serve as the synchronous communications controller without any additional hardware, they can be more cost-effective than internal adapters.

When you want to communicate with and control something more mundane than a mainframe, you might want to convert your PC's serial port to the GPIB (General Purpose Interface Bus, a.k.a. the Hewlett-Packard Interface Bus, a.k.a. the IEEE-488 standard), which is heavily used in industrial control systems. Using a converter or a GPIB expansion card inside your PC, you can operate mills, lathes, and entire assembly lines from your PC keyboard.

Black Box also sells hardware to give ASCII and PC compatibility to venerable Baudot devices such as 1930s teletypes that use a 5-bit standard, and equipment using other esoteric standards.

#### Modems and Nonmodems

With all the fanfare accorded to the new 2,400-bps modems you can plug into your PC, you'd think they were reaching the

limits of technology. Faster modems are readily available, however, and some of them are advertised for prices that strain one's credulity—such as 9,600-bps products for about \$100. Other 9,600-bps modems cost thousands of dollars.

The reason for the big difference in price among so-called high-speed modems is evident from their descriptions. Although the cheap devices are generally termed "short haul" modems, they're not really modems at all but instead are "line drivers." Rather than converting your computer's digital signal into modulated analog tones that telephone lines accept (which is what true modems do), these short-haul "modems" merely convert the RS-232 standard signal into something more like the RS-422 standard, which is less affected by distances. Instead of coding your data in voltage pulses as called for in the RS-232 standard, most short-haul modems convert the digital code into current changes.

Don't be tempted to substitute a short-haul modem or line driver in place of a real modem. Short-haul modems cannot be connected to dial-up telephone lines because their essentially DC digital signals will not work in the analog-only telephone system. But short-haul modems can stretch the range of your serial port from a hundred feet to several miles if you use your own wiring or lease loops with DC continuity.

The exact maximum distance rating for short-haul modems varies with data speed and the type of connecting cable used. The slower the data and the better the cable, the longer the range.

True high-speed modems, which operate at rates up to 9,600 bps, all use the same technology to squeeze as much information through standard dial-up telephone lines as fast as possible. All modems faster than 300 bps use combinations of amplitude and phase modulation to encode your PC's digital signals. Additionally, they automatically and continuously compensate for variations and degradations in the telephone line. As the data rate increases, small variations in the connecting telephone lines become more critical, and more-sophisticated modems use elaborate electronic equalizers to correct for telephone line inconsistencies.

To increase their speed, faster modems forego simultaneous talking and listening and send signals down a single phone line only one direction at a time. (Most PC-compatible modems that operate at up to 2,400 bps and a few exotic 4,800-bps units use full duplex communications, which means they can send and receive simultaneously.) Although many 9,600-bps modems are capable of full duplex operation, they must use special four-wire circuits. These can be either dedicated lines that you connect yourself or lease by the month from the phone company, or a pair of ordinary two-wire dial-up connections.

#### Multiplexers and Data Compressors

A single connection can have a capacity far in excess of one communications channel. The telephone company regularly squeezes dozens or hundreds of calls down a single circuit. The trick is to divide up the whole line between individual calls through the use of a special device called a multiplexer or MUX.

Multiplexers usually work by one of three methods. *Time division multiplexing* quickly and repeatedly switches between calls, giving each call access to the circuit in turn. For instance, the multiplexer might scan between ten calls every millisecond, connecting each one to the line for one-tenth of a millisecond. *Frequency multiplexing* assigns each call a frequency and then mixes all the different frequencies together. Essentially, each call becomes a tiny radio station that shares the single circuit with several others, just as broadcast stations share the same airwaves. *Digital multiplexing* actually combines the separate digital codes of each call together to create one overall code.

Although a multiplexed system might seem similar to a network because several computers can share a single cable, the underlying principles are different. When computer communications circuits get hard to find or expensive, multiplexing can help you get more from every wire.

The simplest multiplexers make use of what you have. For instance, they combine the serial signals from two computers so that they can be sent through a single modem to two other devices at the other end. After several signals are multiplexed together and transmitted, they must be de-

multiplexed back into their original form to be used. Hence, a multiplexed system requires a special electronic device at both ends of the circuit.

Over dedicated lines that may have no analog speed limit, you can multiplex more than just a couple of calls. Black Box, for instance, offers a 32-channel local multiplexer by means of which each channel on a high-speed, two-wire circuit

*Not even the most expensive multiplexer can slice up a circuit to make it carry more data than it was designed to handle.*

up to 6,000 feet long can operate at up to 9,600 bps.

No device—not even the most expensive multiplexer—can slice up a circuit to make it carry more data than it was designed to handle. Hence, when you multiplex the two computers to the input of a single 1,200-bps modem, each computer effectively communicates at half that speed, or 600 bps. Thus using a combination of ordinary multiplexers, modems, and phone lines and more than a couple of channels is desirable, at best, only if you have a lot of time on your hands and are assured of immortality.

Slicing the power of even a 9,600-bps modem 8 or 16 ways with nothing more than a multiplexer does not increase the total communications capacity of the line, but instead results in rather mundane 1,200- or 600-bps performance.

Long ago, however, the telephone company learned how to squeeze more channels through the same wires by taking advantage of the time that people use to breathe, think, and otherwise hold their tongues. More than half the time a telephone is connected, part of the line is idle,

and so the telephone company developed sneaky devices that steal away the connection from one call for another when nothing is being said, then quickly restore it when the talk begins anew. Enough empty space is spread out among lines and conversations that you may never notice when your line is borrowed by another call.

Using similar principles, data concentrators—also called statistical multiplexers—can squeeze more than one high-speed link down a single communications channel of the same speed. In addition to taking advantage of dead time, data concentrators use sophisticated coding schemes to load more data into a given number of bytes. By operating synchronously instead of asynchronously, data concentrators can add even more capacity by eliminating unneeded start, stop, and parity bits.

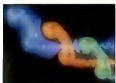
In typical applications seven or eight 9,600-bps channels can be connected through a single line. Each channel still operates at full speed, and no one would notice that the line is being shared.

Concentrators are available from many sources. Black Box offers concentrators that accept up to 16 inputs, and Complex Systems, Inc. in Huntsville, Alabama recently announced an economical seven-channel statistical multiplexer.

Even at the higher prices of more exotic models, data concentration can give substantial monetary benefits. For instance, a single dedicated transcontinental 9,600-bps data link may cost \$8,000 per month; eight channels would cost \$64,000. In contrast, data-concentrating multiplexers, which cost between \$1,500 and \$5,000, could pay for themselves in line savings in a single day!

While the benefits of other hardware solutions to communications problems may not be quite that dramatic, all can bring you substantial savings and diminish the headaches you encounter in dealing with your computer. The few products discussed here are only a sample of the solutions available to you, all meant to confirm your suspicion that when you think there must be a better way to do things, there probably is. ■

Winn L. Rosch is a contributing editor for PC Magazine.



# THE SMARTEST MODEMS OF THEM ALL

*Three modems intended for mainframes, the CDS 224 Autodial, the 2400PA, and the DATAPHONE 2224BD0, can bring advanced communications capabilities to your PC. However, it may be difficult to get your software to speak their language.*



A new breed of modems has grabbed the spotlight: 2,400-bps modems for use with the PC. If you think these newcomers represent the first generation of smarter, faster modems, however, take another look. The mainframe market has used 2,400-bps modems since 1982.

The first modems to use the V.22 bis protocol, a communications protocol for 2,400 bps modems, were the CDS 224, the Racal-Vadic 2400PA, and the AT&T DATAPHONE 2224BD0. All three are aimed at the mainframe market rather than the personal computer market. They tend to be more expensive than modems designed for the PC market, and they require that you make adjustments to your PC's communications software. But they also offer more standard features and greater flexibility than the PC versions.

Built-in help, common to modems de-

signed for the mainframe market and rarely found in those designed for the PC market, is the kind of feature you can expect from these high-powered modems. If you are controlling the CDS 224 directly from your keyboard, for example, you can type the letter H followed by a return, and the modem will put a list of all the various commands on screen. You can also ask for detailed information on a specific command.

The 2400PA and the DATAPHONE 2224BD0 have similar help features. In each case the built-in help gives you what amounts to an electronic reference card. (What an improvement over having to search in a desk drawer!)

Physically, these three models are external RS-232 modems that connect directly through the RS-232 port on the standard module. Like the 2,400-bps modems designed for the PC market, these modems

offer auto-dial, auto-answer, and manual originate and manual answer.

All three modems can communicate at 2,400 bps using the V.22 bis protocol or at 1,200 bps using the Bell 212 protocol. And all three can handle a synchronous or asynchronous communications format at either speed. (Asynchronous format is the most common for communications with a PC. Synchronous format, potentially important for the much-discussed micro-to-mainframe link, is unusual on modems for the PC market, while it's a fairly standard feature on modems built for the mainframe market.)

In addition, the AT&T 2224BD0 and the Racal-Vadic 2400PA modems support the Bell 103 protocol at 0 to 300 bps, in

Three smart modems (left to right): AT&T DATAPHONE 2224BD0, Racal-Vadic 2400PA, and Concord Data Systems 224 Autodial.



Photograph: Marc Cohen

asynchronous format only. The fact that the CDS 224 is not able to communicate using these protocols means that it's of limited value to the PC user. Some bulletin boards and many individual users still can communicate only at 300 bps using the Bell 103 protocol.

Finally, each of the modems has extensive self-diagnostic capabilities—one of the features you won't generally find on modems in the PC market. My experience has shown, however, that you can easily do without these tests, although they are useful in helping you to track down equipment problems.

To evaluate how these modems differ from each other and to determine their suitability for use with the PC, I tested all three versions using three communications programs: *PC Talk III*, *Omniterm 2*, and *Crosstalk XVI*. I evaluated manual dialing, auto-dialing, and repeat auto-dialing functions as well as the modems' performances at 300, 1,200, and 2,400 bps. Here's a look at how each modem fared.

## PC FACT FILE

**CDS 224 Autodial**  
Concord Data Systems  
303 Bear Hill Road  
Waltham, MA 02154  
(617) 890-1394

**List Price:** \$595

**Requires:** RS-232 serial port, communications software.

**CIRCLE 697 ON READER SERVICE CARD**

**2400PA**  
Racal-Vadic  
1535 McCarthy Blvd.  
Milpitas, CA 95035  
(408) 946-2227

**List Price:** \$995

**Requires:** RS-232 serial port, communications software.

**CIRCLE 696 ON READER SERVICE CARD**

**DATAPHONE 2224BD0** (with auto-call)  
AT&T Information Systems  
1701 Campus Dr.  
Somerset, NJ 08873  
(201) 271-3438

**List Price:** \$1,265

**Requires:** RS-232 serial port, communications software.

**CIRCLE 695 ON READER SERVICE CARD**

### CDS 224 Autodial Modem

The first thing you'll notice about the modems reviewed here is their size. The typical external modem for the PC market is about 1 1/2 inches high and fits unobtrusively under a desktop phone. But none of these modems is that discreet. The CDS 224, for one, is 2 3/4 inches high, 9 1/4 inches

*The drawback to the CDS 224, or any other modem that is designed for the mainframe market, is the lack of available software.*

deep, and 8 1/2 inches wide. That's more than twice as high and nearly half again as wide as the Hayes Smartmodem.

One of the reasons these modems are so large is the number of controls on their front panels. The typical smart modem for the PC market has a bank of 7 or 8 status lights and perhaps an on-off switch. The CDS 224 front panel has 11 status lights in two banks plus 12 pressure-sensitive switches, each with its own internal indicator light.

The 11 status lights include such prosaic items as a power-on light, a ring indicator (the modem's visual equivalent of a ringing telephone), and the "signal quality" indicator (which lights up to tell you when signal quality is good and turns off to warn you when the signal is marginal and therefore prone to error). Other status lights monitor various lines on the RS-232 connection. They can help you track down communications problems when (not if) they occur.

Six of the 12 DIP switches on the CDS 224 are paired off, letting you switch between data and voice, between the originate and answer modes, and between synchronous and asynchronous communications. Four other switches are used for

running various tests. The last two are an on-off toggle for automatic answer and a "fallback" toggle.

The misnamed fallback toggle actually toggles between 1,200 and 2,400 bps. If fallback is off and you are originating the call, the CDS modem will try to establish communications at 2,400 bps. Failing that, the modem will fall back to 1,200 bps. If the fallback toggle is on, the modem starts at 1,200 bps, and thus it has nowhere to fall back to.

The front-panel switches on the CDS 224 can be disabled, a feature, no doubt, designed for data processing managers who want to keep the peons from messing with the equipment. Two other signs of the intended market are the number of DIP switches—four banks of eight switches each—and the fact that these switches are located inside the box, meaning you have to take the modem apart to get at them. Fortunately, the manual does a good job of telling you everything you need to know to set the switches properly, but if you're new to communications, you may find parts of the manual tough to follow.

### Tapping In on Smart Dialing

Making a call with the 224 is easy. You give the modem a phone number from the keyboard or through software and let the modem do its stuff.

Auto-dialing is one place where a smart modem gets to show just how smart it is. Most auto-dial modems for the PC market follow the lead of the Hayes Smartmodem 1200, the actual standard for that market. The Smartmodem simply picks up the phone, dials blind, and then waits for a predetermined amount of time to elapse (the default is 30 seconds). If it hasn't heard another modem by then, it aborts the call and puts the message NO CARRIER on screen.

Smarter than the Smartmodem, the CDS 224 monitors each step in the call and makes decisions as it goes. First, it listens for a dial tone unless ordered otherwise. If it doesn't hear one, it will say so with a message on screen and will abort the call.

The 224 can be told to use either pulse or tone dialing, but the default is adaptive dialing, another feature you won't find on most modems for the PC market. With adaptive dialing, the modem sends the first

digit as a tone; then it listens to see if the dial tone is still there. If the tone is gone, the modem dials the rest of the number using tones. If the tone is still there, the modem switches to pulse and redials.

Unlike the Hayes Smartmodem, the CDS 224 doesn't have a speaker to let you hear a call. Instead, it keeps you posted through screen messages. It's smart enough to differentiate between a ringing phone, a busy signal, and several other possibilities. It can even detect a voice on the other end of a line. A typical sequence of messages might run:

DIAL TONE  
DIALING (number)  
RINGING  
ANSWER  
ANSWER TONE  
INITIATING

Other messages include NO DIAL TONE, BUSY, NO RINGING, NO ANSWER, NO ANSWER TONE, and VOICE DETECTED.

#### Matching Modems with Software

The drawback to the CDS 224, or any other modem designed for the mainframe market, is the lack of available software. Most communications programs for the PC are written for the Hayes Smartmodem 1200 command set. Many of these programs will work with other command sets as well, but not every program will work with every modem.

The command set on the CDS 224 has almost nothing in common with the standard Hayes command set. For example, it uses carriage returns to preface a command, rather than the familiar AT, or ATTENTION, command of the Smartmodem. Most programs will let you define the ATTENTION command to match your modem, but in some cases a carriage return is simply not an option.

A few test runs showed that CDS 224 works satisfactorily with *Crosstalk XVI* and the *Omniterm 2*. You can also control it from the keyboard with *PC-TALK III*, but then you must ignore the software's auto-dial feature.

If you have a favorite communications program, feel free to experiment. But you may find you'll have to play around with both modem and program settings before you can make them work together.

#### Racal-Vadic 2400PA

The Racal-Vadic 2400PA is about the same height as most modems for the PC market, but it's also one-third wider and deeper (8 by 13 1/4 inches). Like the CDS 224, it has a full front panel, with 10 status lights and 10 pressure-sensitive switches.

The status lights are similar to those

*The Racal-Vadic 2400PA's telephone directory is much more sophisticated than the directories in most PC communications programs.*

found on the CDS 224. They include a power-on light, a ring indicator, and status lights for a half-dozen lines on the RS-232 connection. Also, a high-speed light indicates 2,400-bps operation, and an error light flashes when errors occur during the self-test. The error light doubles as a signal-quality light.

The pressure-sensitive switches do pretty much the same things their equivalents on the CDS 224 do. A single switch toggles between data and voice, and another toggles between answer and originate modes. Two switches choose among 300, 1,200, and 2,400 bps (if both are off, the setting is 2,400). Two other switches are labeled "redial" and "reset." The redial switch tells the modem to call the last number dialed, bypassing your software. The reset switch puts the modem back in its idle mode, giving you an easy way to abort a call that is already in progress.

Unlike most modems, the Racal-Vadic 2400PA does not have DIP switches. On-board software controls the options, (one of which is the choice between synchronous and asynchronous communications), and memory backed up by battery maintains them. Thus you never have to set the options. And to make things even easier,

the modem displays the current setting of any or all options on request.

#### Important Numbers

The auto-dial feature on the 2400PA is one of the most sophisticated I've seen. Like the CDS 224, the Racal-Vadic 2400PA monitors the phone line and makes dialing decisions as it goes. Again there is no speaker, but the modem keeps you posted with on-screen messages. These messages are essentially the same as those used by CDS 224.

In contrast to the CDS 224 or most other modems, the 2400PA maintains its own telephone directory. This directory can hold up to 15 phone numbers, complete with log-on information and passwords. The 2400PA telephone directory is much more sophisticated than the directories in most communications programs. It will even allow you to link numbers together. For example, if your local Tymnet number is busy, the modem will automatically call through the Uninet system. But the 2400PA shares an unfortunate feature with the CDS 224: its command set has almost nothing in common with the Hayes command set, and the command preface includes a carriage return.

The 2400PA does not work well with *PC-TALK III*. You can control the modem from the keyboard at 1,200 bps, but the modem refuses to work with *PC-TALK* at 300 or 2,400 bps. Trying to make the combination work on a PC AT gave me considerable practice using Ctrl-Alt-Del. On the bright side, the 2400PA does seem to work with *Crosstalk XVI* and with *Omniterm 2*, although getting it to work took some experimenting.

Another plus is that Racal-Vadic writes the most readable modem manuals I've seen. And they provide a toll-free number to call should you run into problems.

#### AT&T DATAPHONE 2224BD0

Physically, the AT&T DATAPHONE 2224BD0 is the most imposing of the three modems reviewed here. Measuring 7 inches wide by 11 inches long, the 2224BD0 has nearly the same footprint as the 2400PA; however, it is also 3 inches high, twice the height of the 2400PA. In addition, its front panel has enough switches and varicolored lights to outfit the bridge

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*The 2224BD0's commands are quasi-compatible with the Hayes command set—they aren't exactly the same, but they do look familiar.*

bps, 1,200 bps, or low (0-300 bps). Each of these has a corresponding push-button switch to select speed.

A push-button data switch toggles the modem back and forth between voice and data mode. This same switch doubles as an indicator light, flashing when the phone rings and lighting up in data mode. The front cover swings open to reveal four more push-button switches for running various tests.

Like the CDS 224, the AT&T DATAPHONE 2224BD0 has numerous DIP switches. Three banks of eight switches each are accessible through a cutout in the back panel. One of these switches chooses between synchronous and asynchronous format. There is also a bank of four switches on the front panel, hidden only by the front cover. Reducing the general ease of accessibility, two more banks of switches are hidden inside the box. If you want to get to them, you must take the modem apart. Fortunately, these switches control options that you're not likely to want to change from the factory settings.

AT&T refers to the auto-dial feature on

the 2224BD0 as auto-calling, to distinguish it from blind dialing. It does essentially the same job the auto-dial on the CDS 224 does. The 2224BD0 monitors the phone line and makes dialing decisions as it goes, checking for dial tones, busy signals, and the like. The modem sends on-screen messages to keep you posted, but it also has a speaker, so you can listen to the call being made. The volume control on the front panel is easy to reach.

The auto-call feature includes a phone directory. It is limited to four numbers and does not include log-on information. If the modem were attached to a dumb terminal, this feature could be useful, but PC users should ignore it.

The DATAPHONE 2224BD0 commands are quasi-compatible with the Hayes command set. The commands aren't exactly the same, but they do look familiar. One of the ways you can give commands uses the familiar attention prefix AT. Other commands that Smartmodem users will recognize are P for pulse dialing, T for tone dialing, and comma (,) for pause.

**High Compatibility**

Of the three modems reviewed here, the 2224BD0 was the easiest to get working with *Omniterm 2*, *Crosstalk XVI*, and *PC-TALK III*. Oddly, *PC-TALK III* balked at using its manual-dial feature with this modem, although it didn't have any trouble with auto-dial. You can get around that problem, however, by typing your commands directly from *PC-TALK*'s terminal screen. And if you're familiar with communications, you shouldn't have too much trouble getting the 2224BD0 to work with most programs.

Unfortunately, the key word with any of these modems is *trouble*, and the obvious question is, Why should you put up with any? The decision you have to make is whether the extra features are useful enough to outweigh the inconvenience of having a nonstandard command set. If you decide that they are, and you're willing to put in a little extra effort and perhaps foot a higher bill, any one of these modems will work just fine with your PC.

*M. David Stone is a frequent contributor to PC Magazine.*

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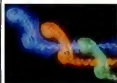
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# E-MAIL FOR THE WELL CONNECTED OFFICE

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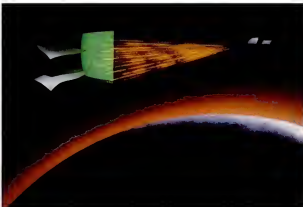
If you've ever used electronic mail on services like The Source, CompuServe, or MCI Mail, you already know that e-mail is a fast, convenient way to exchange information. What you may not know is that it is easy to set up and customize your own electronic mail system.

In its broadest sense, electronic mail includes any computer-based message system. Most often, messages are kept on a single computer that acts as a kind of central post office. The computer connects to the phone lines by modem and uses specialized communications software that runs on "automatic pilot" in what is usually called unattended or remote mode. Users can call the central PC to get or leave messages.

Beyond this bare-bones description, the nature of electronic mail varies dramatically from one system to the next.

## Types of Service

To begin with, not all e-mail systems depend on a central mail drop. In some



cases, each PC in the electronic mail network acts as its own post office. Each has its own e-mail software, and each calls other individual PCs as needed to leave messages. Users typically prepare their mail during the day, set their system for remote mail overnight, and check for incoming messages the next morning.

There are also at least three different kinds of computer-based message systems, and any given program may provide any combination of the three.

First, and most obvious, is private mail—a kind of in-house version of MCI

Mail. With private e-mail, each registered user has an electronic mailbox. Messages are sent to a specific user or group of users, and each user can read only those messages that have been sent to his or her mailbox.

The second kind of message lets you send and receive files. This is obviously important if you need to send spreadsheet or database files to someone, but be aware that the capability can also be helpful with text files. Most

popular word processors deviate from standard ASCII codes, at least in their formatting commands. If you send the file as a data file, you can retain all the formatting information, making it easy to print.

The third kind of message system is the popular bulletin board system, like those operated by user groups. Bulletin boards let you post messages for all users to read. This approach allows for a kind of roundtable discussion, with each member checking in at his or her convenience. Such discussions are usually called conferences, and they offer a useful way for a group to

share ideas even when conflicting schedules make face-to-face meetings difficult.

E-mail systems can vary greatly in their security features as well. A system may have no security measures at all, in which case anyone can call up, sign on, and do anything the software allows. This may be appropriate if the software won't let you do much, but it's definitely not a good idea if a caller can change filenames, erase files, or otherwise do damage.

Security measures usually include password protection for signing on to the system. Ideally, this is combined with varying levels of access for different callers. Access levels allow the system operator, or sysop, to use DOS commands, including ERASE, to manage files from a remote computer, while other users can only send or receive messages. This technique could, say, limit a first-time user to downloading only the information needed for registration—if, indeed, the sysop chooses to allow unregistered callers on the system at all.

Not surprisingly, the "best" program to use for your e-mail system depends very much on what you want to do with it. Here's a look at three typical applications and how each might be approached with available communications software.

#### #1: Staff in the Field

*A small management consultant firm has several staff members who spend most of their time working outside of the office with various clients. The firm needs an electronic mail system to maintain communication between the office and the staff members as well as to maintain communication among staff members.*

An application like this must be built around a centralized e-mail system since the staff members will generally be sending messages from other people's computers, and a private e-mail feature would ensure that messages are automatically directed only to the right individuals. Two programs that could fill the bill in this situation are *REMOTE* from Microstuf and *Conexus* from New Era Technologies.

*REMOTE* is not primarily an electronic mail program, though private e-mail is certainly one of its capabilities. (For a review of *REMOTE*'s other capabilities, see "Long-Distance Computing at Full Pow-

er," *PC*, Volume 4 Number 13.)

Setting up the e-mail feature in *REMOTE* is a simple matter of entering the name and password for each user (each staff member in this case). *REMOTE* can automatically go into e-mail mode whenever a staff member signs on, or you can require another startup command on a

**The send feature on REMOTE lets you send messages to selected individuals or to everyone on the system with a single command.**

user-by-user basis.

When using *REMOTE*, you can go into the mail system at any time, regardless of the startup command that goes along with your name and password. *REMOTE* will automatically check to see if you have any messages waiting in your in box, and it will give you the choice of reading the messages or scanning them.

The send feature on *REMOTE* lets you send messages to selected individuals or to everyone on the system with a single command. This second choice is useful when you send office-wide memos. The program will also notify you when messages have been received so you can keep track of who has already read a memo.

When sending text, you can type it in manually with *REMOTE*'s line-by-line editor or call it from a file you've written on your local system. One very nice touch is that the program will let you take advantage of virtually any word processor or text editor on the host system.

The key to understanding *REMOTE* is to realize that the program's major purpose is to let you use the host computer from a remote location—your off-site keyboard and screen substitute for the host's keyboard and screen. The standard approach

for controlling a system remotely is to intercept screen output at the operating system and send those characters to the modem. This method doesn't always work because many programs bypass the operating system and deal directly with the hardware.

*REMOTE* gets around this problem with a screen mode in which the program reads a screen and sends an image of it to the modem. Thanks to this feature, you can create your messages on the host computer with a full-screen word processor and then tell *REMOTE* to read the text from that file into an e-mail message. The screen mode slows things down and occasionally hangs up the system, but by and large the scheme works, letting you take advantage of programs like *WordStar* that are normally impossible to use from a remote location.

#### REMOTE Problems

*REMOTE*'s one significant failing is in its security features. When the program answers the phone, it asks only for a password. This makes it relatively easy to break into the system. Another security drawback is that *REMOTE* has only one access level. Someone who manages to enter the system can do anything with it—from getting into your database files to reformatting your hard disk.

*REMOTE* does, however, give you several alternative ways to protect your data. You can tell the program which ring to answer on; set the number high enough and you're likely to discourage random callers. You can also discourage unwanted guests by allowing only two or three tries for entering a password. The program comes set for five tries, but you can lower the number with a simple menu choice.

Another useful security measure is that the message file in *REMOTE* is encrypted so that it cannot be read with a text editor or through the DOS TYPE command. This encryption ensures some degree of privacy since users can't read each other's mail. Unfortunately, it does nothing to stop someone from destroying the file entirely.

A log of system activity is included. This record lets you keep track of who called and when. Aside from telling you whether your staff members are checking in regularly, the log can alert you to any se-

rious effort to break into the system since it also keeps track of failed log-on attempts.

All told, *REMOTE*'s security features are probably adequate for a private e-mail system for staff members who will not be discussing sensitive information. But it is best used on a computer that has been carefully pruned of confidential files and one that is dedicated largely—if not entirely—to electronic mail.

*REMOTE* works at speeds up to 9,600 bps, and it can talk to about 30 common terminals, including the DEC VT-100 and the IBM 3101. The VT-100 is probably the most common terminal emulated by PC terminal programs. The 3101 can be imitated by using *PC-TALK III* if you first modify the program with an appropriate merge file. (See "The Urge to Merge," *PC*, Volume 4 Number 5.) *REMOTE* is designed to work with *Crosstalk XVI*, also from Microstuf, and allows file transfer with *Crosstalk* only.

#### In a MIST

*Conexus* is one of the more-interesting electronic mail programs, if only because it is not so much a standalone program as an application within a program. The "real" program here is *MIST+*, Version 1.3, from New Era Technologies, Inc. *MIST* is basically a development tool that includes a text editor, a lexicographical database, and telecommunications capabilities. (A lexicographical database searches through the entire text of a file rather than using fields.)

*MIST* is a programming language in the same sense that *dBASE II* is a programming language. And because *Conexus* is a template within *MIST*, it comes complete with source code. If you're willing to delve into *Conexus*, you should be able to customize it precisely for your needs.

*Conexus* is easy to set up for private e-mail. You enter the name, password, and access level for each staff member and tell *Conexus* to establish the message system. After that, the program will automatically check for mail whenever someone signs on, and it will tell the user whether there are any messages waiting in his or her mailbox.

When you send a message, you can type in your text with a line editor or you can send it from a file on your local com-

puter. *Conexus* has several useful options, including the ability to send carbons and the ability to trace a message to find out if it has been read yet.

*Conexus* also has several important security measures built into it, making it much more trustworthy than *REMOTE*—both for keeping unwanted callers off the

*Conexus will talk to any terminal that can act as a TTY device, making it perfect for dealing with clients with varied equipment.*

system and for protecting the system from people who are intent on doing damage. To sign on to *Conexus*, you must give both a user name and a password. Hitting on one item by chance won't do much good. After four unsuccessful tries at getting the password right, the system hangs up.

Registered users can be assigned any of eight access levels. Most users can be given the aptly named "regular" access, which lets them send and read messages. There are three levels below that, and four levels above, all the way up to the "gatekeeper," or sysop. Even the sysop can't drop into DOS, which means that no one can reformat your disk for you.

Given the security features on *Conexus*, you can easily extend this application to give access to clients as well as staff members. At the very least, this branching out can give you a convenient, reliable way to exchange private, client-specific information. But that's not all—in addition to its private e-mail feature, *Conexus* has a well-designed bulletin board capability.

#### Back to the Bulletin Board

*Conexus* makes a distinction between bulletin boards and conferences, and it will let you create an unlimited number of both.

There are several minor differences between bulletin boards and conferences in *Conexus*, but the one that really matters is their status as public or private. Anything designated as a bulletin board on *Conexus* is public, meaning that it is available to anyone on the system. Conferences, though, can be private, so that messages can be read only by users who are listed as conference participants.

This means you can establish one or more private conferences for each client. A client can sign on, choose conference from the main menu, then enter the name of the conference he or she belongs to. Other users will not only be barred from entering the conference, they won't even know it exists. When a user asks for a list of conferences, the system will ignore any that don't include that user on the member list.

*Conexus* will talk to any terminal or computer that can act as a standard TTY device, which makes *Conexus* perfect for dealing with clients who have varied equipment. What's more, for each of the 899 possible users, *Conexus* will remember the correct settings for screen display and the like. The program will also keep track of calls with an activity log, which can be recorded on printer, on disk, or both.

However, *Conexus* is currently limited to a maximum of 1,200 bps. New Era Technologies says that it plans to implement 2,400 bps, but the upgrade will cost licensed users an additional \$50. As it is, the price is already a bit steep: *MIST* sells for \$495, and the *Conexus* template costs \$129, for a total price of \$624.

#### #2: Idea Exchange

A project development team needs an e-mail system to serve as a meeting place to develop ideas. In addition to using the conference feature, the development team should be able to exchange text and data files, and each member should be able to leave messages addressed to any of the others. Members of other departments may occasionally need to sign on to the system and leave messages for some or all of the development team, but these casual users should not be able to read the conference in progress or download the files.

A centralized e-mail system is essential

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Intro and How To Use  
Word Processing MS-DOS (2.0)  
Business Software PC-DOS (2.1)  
Data Bases Home Accountant  
Compaq VW Deluxe  
IBM-PC Basic

each 32

### •TRAINING POWER PROGRAMS

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Multiplan Supercalc 3 Framework  
Symphony Wordstar TK/Solver

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 Floppy Drive Controller 119

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PCnet Blossom 64k Blossom Board with the Daughter Board installed call

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PC Net (stand alone card) call

**Paladin - See VisiCorp**

**Paradise Systems**  
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 Multidisplay Card 195  
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Quadcolor I 197

Quadchrome RGB Monitor 469

Quadchrome II 449

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available for:

DOS/Basic 1.1 Wordstar

DOS/Basic 2.0-2.1 Wordstar 2000

DOS 3.0-3.1 Turbo Pascal

Lotus 1-2-3 WordPerfect

Symphony dBase II

Multiplan (IBM) dBase III

Multiplan (Microsoft) Framework

Volkswriter Deluxe Multimate

Supercalc 3

## Toshiba

P351 printer \$1239

P1340 printer call

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Visi Mouse (2 button Mouse Systems mouse, PC Paint 1.0 & pop-up menu software 3.0) 89

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Joystick 35

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(5 1/4") half-height drive (DS/DD) 89

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10 Meg cartridge 48

**Maynard Electronics**

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WS-1 Controller 797

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WS-2 Controller 969

**Tandon**

TM 100-2 (5 1/4") full-height drive (DS/DD) 109

10 Meg Internal hard disk w/controller (complete package) 479

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## MEMORY

64k Memory Upgrade Set for IBM-PC or XT system board 10

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Install memory upgrades & run diagnostics at time of board purchase only 10

256k Memory Upgrade Set for any IBM-AT memory board 49

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**MAXELL**

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Compuserve Information Service (includes subscription, manual, 5 hours of connect time, monthly publications) 19

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The Source (subscription & manual) 39

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Inverted Back



Gbs5lpBack-001B

Back

1. Follow instructions on the other side

# dazzling dialogue, d

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Cuthroat (standard)	25
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## HARDWARE

AST Research (For IBM-PC or XT)	
All AST Boards come with SuperDrive, SuperSpool, and one year warranty	
SoPaKPlus 64k upgradeable to 384k, with clock/calendar, serial and parallel ports & now includes Borland Sidekick version 1.5 (non-protected) game port optional	249
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AST-5251-12	\$529
AST-5251-11	709
AST-3780	589
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Advantage 128k upgradeable to 1.5 Meg (more with piggyback card) with clock/calendar, serial and parallel ports (game port optional)	399
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Video 300G monitor (green)	139
Video 300A monitor (amber)	149
Video 310A monitor (amber)	179
Color 600 - RGB monitor	399
Compucable	
Plastic Keyboard & Drive Cover Set	17.
IBM Mono Screen Enhancement	17
Curtis	
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PC Pedestal (for IBM Mono or Color)	37
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Static Mat	27
The Crystal 150-watt	135.
The Crystal 300-watt	159

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Extension Cables for IBM Mono Display	33
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Printer to IBM Cable (specify printer)	19
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### SURGE SUPPRESSORS

All surge suppressors have an on/off switch.	
Diamond (6 outlets)	32
Emerald (6 outlets; 6 ft cord)	39
Sapphire (3 outlets; EMI/RFI filtered)	52
Ruby (6 outlets; EMI/RFI filtered; 6 ft cord)	59

### Epson

All Epson printers have built in graphics capability.

LX-80	call
RX-100	call
FX-85 (new)	call
FX-185 (new)	call
JX-80	call
LO-1500 (letter quality dot matrix)	call
Printer to IBM Cable (specify printer)	19

### Hayes

Smartmodem 300	149
Smartmodem 1200	429
Smartmodem 1200B (w/Smartcom II)	369.
Smartmodem 2400	call
Smartcom II 2.1 (software)	89
Custis' Smartmodem-to-IBM Cable	19

### Hercules

Hercules Graphics Card (parallel port) special	
Hercules Color Card (parallel port)	169
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Masterpiece	94
Printer/portable computer stand	17.

For the IBM-PC Exclusively.

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## THE DETAILS ON E-MAIL

Here's a comparison chart of the various programs available to help set up a do-it-yourself electronic mail system.

Program	Company	Phone	Price	Modes	Baud	Std/Rev Files w/Protocol
<b>REMOTE</b>	Microstuf 1000 Holcomb Woods Pkwy, Suite 440 Roswell, GA 30076 CIRCLE 668 ON READER SERVICE CARD	(404) 998-3998	\$195	Priv. e-mail Remote operation	300 to 9600	Proprietary; works with Crossstalk only
<b>Conexus</b>	New Era Technologies, Inc. 1252 Columbia Rd, NW Washington, DC 20009 CIRCLE 671 ON READER SERVICE CARD	(202) 234-2117	\$624 (\$495 for Mist, \$129 for Conexus)	BBS (public only) Priv. conf. Pub. conf. Private e-mail	300 to 1200	Xmodem
<b>RBBS-PC</b>	Capital PC Software Exchange P.O. Box 6128 Silver Spring, MD 20906 CIRCLE 669 ON READER SERVICE CARD	Can download most recent version from: (703) 759-5049 (East) (703) 759-9659 (East) (415) 689-2090 (West)	N/A	BBS Priv. conf.	300 to 2400	Xmodem, MNP optional
<b>PC-Host</b>	S/O Consultants, Inc. 4807 Bethesda Ave, Suite 124 Bethesda, Maryland 20814 CIRCLE 670 ON READER SERVICE CARD	(301) 656-2697 (voice) (301) 986-9408 (data)	\$129	Message systems (BBS or conf.)	300 to 2400	Xmodem
<b>Personal Communications Manager (PCM)</b>	IBM Corporation P.O. Box 1328 Boca Raton, FL 33429 CIRCLE 667 ON READER SERVICE CARD	(305) 982-2658	\$100	Electronic mail	300 to 1200	MNP
<b>PC Com-Plete</b>	Transend 1887 D Toole Ave., C209 San Jose, CA 95131 CIRCLE 666 ON READER SERVICE CARD	(408) 435-0701	\$229	Electronic mail	300 to 19200	Xmodem Xmodem-CRC
<b>Omnikerm 2</b>	Lindbergh Systems 95 Nagog Hill Rd. Acton, MA 01720 CIRCLE 665 ON READER SERVICE CARD	(617) 263-5049	\$175	Unattended answer	50 to 19200	Xmodem
<b>Relay</b>	VM Personal Computing 6 Germantown Rd. Danbury, CT 06810 CIRCLE 664 ON READER SERVICE CARD	(203) 798-6755	\$149	Unattended answer	50 to 9600	Proprietary
<b>Smartcom II</b>	Hayes Microcomputer Products, Inc P.O. Box 105203 Atlanta, GA 30348 CIRCLE 663 ON READER SERVICE CARD	(404) 449-8791	\$149	Unattended answer	110 to 9600	Proprietary
<b>Crosstalk XVI</b>	Microstuf 1000 Holcomb Woods Pkwy, Suite 440 Roswell, GA 30076 CIRCLE 682 ON READER SERVICE CARD	(404) 998-3998	\$195	Unattended answer	110 to 115200	Proprietary Xmodem
<b>Teipac 3.0</b>	U.S. Robotics Inc. 8100 North McCormick Blvd. Skokie, IL 60076 CIRCLE 661 ON READER SERVICE CARD	(312) 982-5010	\$149	Unattended answer	110 to 9600	Xmodem

Password	Individual Password	Levels of Access	Additional Security Measures	Talks to (in host mode)	Max. Number of Users	Minimum Requirements
Yes	Yes	1	None	Any comm. prog. or tty	No max.	128K RAM, auto-answer modem, DOS 2.0 or higher
Yes, 3 tries	Yes, must enter user name and password	8	Private confs. available to members only	Any comm. prog. or tty	899	256K RAM, 1 disk drive and 1 hard disk, 300 or 1200 baud Hayes-compatible modem, DOS 2.0 or higher
Optional	Yes	More than 65,000	Can require preregistration, assign different access levels to different message systems, and assign passwords to different message systems	Any comm. prog. or tty	No max.	192K RAM, 2 double-sided drives, Hayes Smartmodem, DOS 1.1 or higher
Yes, 3 tries	Yes, must enter user name, password, and phone no.	10	Can require preregistration and assign different access levels to different message systems	Any comm. prog. or tty	2000	192K RAM, 2 double-sided drives or hard disk, AT-command-set-compatible modem, DOS 2.1 or higher
No	No	1	None	PCM and other, similar comm. progs. written by Microcom	40 registered users max. in each address book	128K RAM, 1 double-sided drive, IBM asynchronous modem, DOS 2.1 or higher
Optional	Yes, different for each Com-Port system	1	Can require listing in phone book	Com-Port only	No max.	256K RAM, 2 double-sided drives, or hard disk, 300 or 1200 baud auto-answer modem, DOS 2.0 or higher
Optional, 3 tries	No	1	Allows access only to logged drive	Any comm. prog. or tty	N/A	128K RAM, 1 disk drive, auto-answer modem, DOS 2.0 or higher
Yes, 3 tries	No	3	Allows access only to specified drives	Relay only	N/A	128K RAM, 1 double-sided disk drive, auto-answer modem, DOS 1.0 or higher
Optional, # tries	No	1	None	Smartcom II only	N/A	128K RAM, 1 double-sided drive, Hayes Smartmodem, DOS 1.0 or higher
Optional, 3 tries	No	4	None	Any comm. prog. or tty	N/A	96K RAM, 1 double-sided drive, auto-answer modem, DOS 1.0 or higher
Optional, 3 tries	Yes	3	If no password is set, only lowest access is allowed. If a bad password is given 9 times, user ID loses validation.	Any comm. prog. or tty	N/A	192K RAM, 256K recommended, AT-command-set-compatible modem, DOS 2.0 or higher

to this application, but in this case the system must be built around a sophisticated bulletin board rather than a private e-mail system. In addition, unregistered users must be able to use the system; otherwise, the occasional caller from another department will not be able to sign on. Two programs that meet these requirements are *PC-Host* and *RBBS*.

*RBBS* stands for Remote Bulletin Board System, and as the name implies, it is built primarily around a bulletin board function. If you've spent much time on hobbyist or user group bulletin boards, you've probably used *RBBS* since it is one of the most popular BBS programs for the IBM PC. Even if you have used it as a caller, however, you may be surprised at some of its capabilities.

In addition to the public bulletin board, which is more or less standard on most *RBBS*-based systems, you can also set up any number of private conferences simply by creating a pair of files for the conference—one for conference messages and one for a list of the conference members.

The list of members, in this case, would include only the members of the project development team. If there are several topics that should be discussed separately, you can create separate conferences with a different member list for each. A development team member would then be able to sign on to the system using his or her password and go to any subconference he or she belongs to.

Anyone else who got on the system would be barred from the conferences, but unregistered users in other departments could still have access to the public section of the bulletin board to leave messages for members of the development team.

One nice touch in *RBBS*'s bulletin board function is a kind of poor-man's e-mail that lets you specify whom you are posting a message for. In general, anyone on the system can read the message as well, but when the recipient signs on, he or she is given a list of message numbers with his or her name on them. Individual messages can also be protected with a password that sender and receiver have previously agreed upon.

As a mild security measure in this application, you can bar unregistered users from the system and then give out a single

password to all non-team members who might have to contact the development team. Giving out a second password for bulletin board messages prevents someone who hits the first password for getting into the system from reading or entering messages without the second password.

Security features in *RBBS* are exten-

---

**R***BBS lets you assign roughly 65,000 levels of security access, and you can assign a different security level to each command.*

---

sive. You can, for example, assign roughly 65,000 different levels of security access, and you can assign a different security level to each command. You can also require different passwords for different sections of the bulletin board.

*RBBS* lets users send and receive files and will even let you divide the files into several directories to make them easier to find. The system will let you protect files from being illegally downloaded by requiring both a high security level and a password. You can even protect individual files or groups of files with their own passwords.

*RBBS* will talk to just about any communications program and can operate at speeds up to 2,400 bps. The current version will let you transfer text without error checking, or will let you use either the Xmodem error-checking protocol or the newer, somewhat more reliable MNP error-checking protocol. The program also has a number of other features—like color graphics and music—that may be useful for some applications.

*RBBS* is copyrighted, but it is available as "userware," essentially for free. You can find it free for downloading on many *RBBS*-based bulletin boards, or you can

send a check for \$8 to the Capital PC Software Exchange, P.O. Box 6128, Silver Spring, MD 20906.

#### Host with the Most

Like *RBBS*, *PC-Host*, from S/D Consultants, Inc. will let you create up to 99 message systems. There are no special member lists for each conference, but conferences can be restricted according to security level. This arrangement doesn't offer as much flexibility as *RBBS* does, but it should serve for most purposes. *PC-Host* allows ten levels of access. Individuals assigned to a given security level will not even see the menu choices for higher-level conferences.

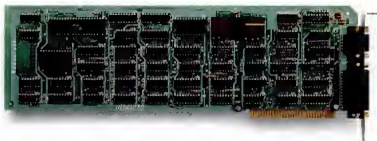
With *PC-Host* you can either keep unregistered users out altogether, or, if you do allow them on, you can bar them from conferences while still giving them access to the public bulletin boards. Again, this would let users from other departments leave messages for members of the development team in the sample application.

*PC-Host*'s e-mail feature is similar to *RBBS*'s in that you can specify whom you are posting a message for and the system will notify the recipient when he or she signs on to the system. Individual messages cannot be protected with a password, however.

The internal security features on *PC-Host* are not nearly as extensive as in *RBBS*. In particular, there is no provision for passwords for protecting different sections of the system; the only access restrictions are based on the user's security level. On the other hand, it is harder to break into the system since you have to give the right combination of user name, password, and phone number in order to identify yourself. The program can accommodate up to 2,000 registered users.

*PC-Host*'s file-transfer capability is roughly equivalent to *RBBS*'s. The program will let you create up to 99 file directories with up to 99 files in each. In transferring files, you have the choice of no error checking or using the Xmodem error-checking protocol. *PC-Host* can talk to just about any communications program and can operate at speeds up to 2,400 bps, and like *RBBS* it sports several "extras" that you may be able to make good use of.

One nice touch is its survey capabili-



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### INTERNAL E-MAIL

ty—basically an automated questionnaire—which can be used in several creative ways. If, for example, the development team in our sample application needs input from management, it can send a memo asking all appropriate individuals to call the bulletin board and answer the survey questions. Similarly, a company can use the survey feature to get feedback from its employees or customers.

Another intriguing feature of *PC-Host* is its Electronic Store module, which lets you list items for sale and take orders. The Electronic Store can be set to take credit card information for ordering through Visa, MasterCard, and one additional credit card of your choice.

Significantly, S/D Consultants makes use of its own product. You can see what *PC-Host* looks like by calling S/D Consultant's own bulletin board at (301) 986-9408. (Use 1,200 or 2,400 bps; the board will not accept 300 bps.) If you like what you see, you can use the Electronic Store to order *PC-Host* while you're at it.

### #3: Branch Offices

A business wants an e-mail system to automatically exchange database files and interoffice mail between widely separated branch offices.

Any of the packages we've looked at so far could be used to set up a centralized e-mail system for this purpose. With *RE-MOTE*, for example, you could create a separate subdirectory for each branch office and have callers place files in the appropriate directories. But security would be a problem, since each branch office would have full access to all the files on the system.

*RBBS* would solve that problem since it lets you set a different password for different groups of files. But a centralized *RBBS* system would need a sysop to take care of managing the post office.

A better solution would be to have each branch office communicate directly with the others using a decentralized electronic mail system. IBM's *Personal Communications Manager* and Transend's *PC Complete* are both designed for this kind of e-mail.

The basic assumption behind *Personal Communications Manager (PCM)* is that several locations run *PCM*, and each loca-

tion will call the others directly whenever it has messages to send.

In order to use *PCM*, you first have to create an "address book" with a complete list of names and phone numbers. When you send a message, you designate the addressee. *PCM* looks up the name and number in its address book, automatically dials

**A**n intriguing feature of *PC-Host* is its Electronic Store module, which lets you list items for sale and take orders.

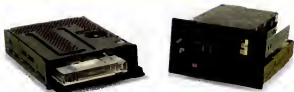
the phone, logs on to the other system, sends the message, and even asks the other system if it has any mail for you.

*PCM* allows a maximum of 40 names in its address book. These can be grouped together into as many as ten distribution lists for sending small-scale mass mailings. Forty names may be limiting if each one represents a different person, but one *PCM*-based computer in each of 40 branch offices will probably handle most needs. You can also address an item with a phone number that is not in the address book.

Using *PCM* is simple enough. The program is completely menu-driven, even down to such details as asking you when it should wake up and start dialing the phone. (You can also send the message immediately.) Anyone remotely comfortable with computers can probably use *PCM* with only a glance at the manual.

*PCM* will let you send items as either messages or data. Messages are sent to a message file on the receiving computer and can be read or printed from within *PCM*. Data files include such things as program files, spreadsheet templates, and database records. These are sent as individual files using the MNP error-checking protocol.

## BT60 Streamer \$895 The Stack \$999



Don't suffer the loss of losing data. **BT60 Streamer** uses a half-height streaming cartridge tape unit that runs on a 5-1/4 in. controller card. Menu-driven software makes it easy of use. Copies up to 60 Megs on one tape at an amazing 5 Megs per minute! Recommended for systems with at least 130 watt power supplies. **The Stack** includes our **PC20** internal hard disk system and the **BT/SP10** tape backup system. **BT/SP10** plugs into the floppy controller card--no extra slot needed--and is accessed like a floppy. It uses spools of tape (\$12.95 each or 6 for \$59.95) that hold up to 10 Megs each. Software provided allows you to back up the **PC20**.

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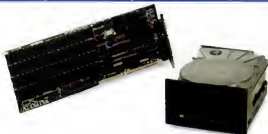
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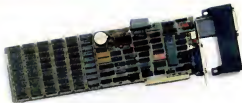
## AT Enhancement Kit (ATK-1) \$1595



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## BT6Plus 64K \$179 BT6Plus 384K \$279



Simply, the best deal on a PC multifunction board--bar none. Basic Time's six function board, the BT6Plus, includes memory sockets for adding 64K to 384K, parallel printer port, asynchronous (RS-232C) serial communications port, battery-powered clock/calendar and electronic disk emulation & print spooling software. Optional game port. Comes complete with an easy-to-understand installation instructions/user's manual.

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### INTERNAL E-MAIL

Once you've addressed the mail and told the system when to send it, you can leave for the day and let *PCM* do its stuff—usually in the middle of the night, when phone rates are lowest. The program keeps an activity log so you can keep track of incoming and outgoing mail.

*PCM* has no password protection or other security features. This could be a problem if someone is actively trying to read your interoffice mail, but the most a random caller can do is leave a message for you. The program can transmit mail only to other computers using *PCM* in unattended mode, but it can receive mail from any ASCII terminal.

Incidentally, *PCM* is not copy-protected, but copies bearing the same serial number cannot communicate with one another. *PCM* can also function as an intelligent terminal for other communications needs.

### Transcendental Communication

Transend's *PC Com-Plate* has a lot in common with *PCM*. The concept is the same—right down to the ability to function as an intelligent terminal for other communications needs. There are a few significant differences though.

To begin with, *Com-Plate* has no limit to the number of names in its address book and no provision for creating mailing lists. More important, it gives you the option of entering an agreed mutual password for each name in the address book. When *Com-Plate* makes or answers a call, the passwords on both sides have to match, or the program will break the connection. If you take advantage of this option, the password acts as a signature, verifying that you are indeed communicating with the right system.

Probably the most important difference between the two programs is whom they will talk to. Where *PCM* can receive mail from any ASCII terminal, *Com-Plate* cannot. On the other hand, *Com-Plate* can automatically send and receive mail through several commercial systems, including MCI Mail, The Source, OnTyme, and Quick-Comm.

### A Last Note

One last point to consider before buying a program for setting up an electronic mail system: Many of the more sophisticated

smart-terminal programs have a built-in remote feature, variously referred to as host mode, unattended operation, or remote access mode.

The remote modes in these programs are generally not as sophisticated as in programs designed primarily for e-mail, but if your needs for electronic mail are simple,

**O**nce you've addressed the mail and told the system where to send it, you can leave for the day and let PCM do its stuff—usually in the middle of the night when phone rates are lowest.

any of these programs may fill the bill.

Most of these programs include password protection and file-transfer capabilities. Some of them, like *Crosstalk XVI*, will let you write sophisticated script files that will match anything that *Com-Plete* or *PCM* can do. The difference is that with these programs, you have to write what amounts to a simple program to get the electronic mail feature to work. With *Com-Plete* or *PCM*, you only have to follow the menus.

If your e-mail needs are sophisticated, or the idea of writing a simple program scares you, then by all means, get specialized e-mail software. But if you already have *Crosstalk XVI*, *Omniterm 2*, *Relay*, *Smartcom II*, *Telpac 3.0*, or any other smart-terminal program in this class, at least take a careful look at what it can do (see chart for some details). You may find that you already have everything you need to set up your own electronic post office. ■

*M. David Stone is a regular contributor to PC Magazine.*

## Enhanced Keyboard ff5151 \$159



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# \$6 Software

How could it be any good for only \$6? Many capable programmers have written high quality programs with complete documentation on disk and request a donation from satisfied users. Other program authors just want people to use the programs they have built and found useful. PC-SIG provides a single source of IBM-PC programs for \$6 per disk. Listed below are sets of some of the more popular disks from the library of over 350 disks.

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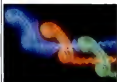
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PC MAGAZINE • SEPTEMBER 3, 1985



# IN TOUCH WITH THE OUTSIDE WORLD

*Through wind or sleet or dark of screen, three top electronic mail systems offer you a wide variety of services, such as mailing lists, paper mail options, and access to on-line database services. Here we grade them on power, features, and ease of use.*

Although intracorporate electronic communications systems have become increasingly useful, most have one important drawback: They can exchange information only within the company itself. Many companies also need a network through which messages and information can be transmitted to and received immediately from clients and colleagues outside. To fill that need, electronic mail services such as MCI Mail, Western Union's EasyLink, and ECHO are fast becoming integral parts of the communications revolution.

The primary function of electronic mail services is to act as clearinghouses for electronic messages. A standard electronic mail service allows individuals and corporations to communicate with other subscribers by electronic mail instantaneously, sending and receiving either by directly typing a note into the system or by uploading a prepared file. Such messages can be sent either to an individual or to hundreds on a list. Additional services can include

paper (or hardcopy) mail, telex and overnight service, access to news services, bulletin board services, and others, but those are only icing on the cake.

## The Big Three

The most popular electronic mail service is MCI Mail, which started its electronic mail service on September 27, 1983 and now boasts some 200,000 subscribers. Besides its basic electronic mail services, MCI Mail offers four different types of paper mail, the option of registering letterheads and signatures, and access to the

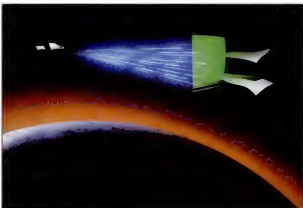
Dow Jones news database.

Western Union, which made a name for itself long before microcomputers existed, first established its EasyLink service in July 1982. Besides individual on-line mailboxes, EasyLink offers its 120,000 subscribers a variety of paper mail options, most of which are connected with Western Union's established services.

The David that's flexing its muscles against these two Goliaths is ECHO (Electronic Com-

munications for the Home and Office), a California-based service that began in March 1984 and has attracted almost 18,000 subscribers. ECHO, which uses IBM systems and mainframes for processing and storage, is a very basic service that hopes to draw ahead in the market through competitive rates and easy use. In addition to electronic mail, ECHO presently offers up to 212,000 characters of free file storage, a user bulletin board, and its own on-line information service.

MCI Mail, EasyLink, and ECHO all provide their subscribers with basic elec-



tronic mail service. The differences involve ease of use, amount and types of options, and cost. These are the factors that really dictate which service a potential subscriber should choose.

### Signing On

A new subscriber to MCI Mail is given two identifying codes: a user name (which is usually your initial and last name) and a password made up of a random—but pronounceable—selection of 8 letters. MCI Mail also keeps on record your mother's maiden name, for phone identification. As with all three of the communications systems reviewed here, MCI Mail accepts either 110-, 300-, or 1200-baud communications speeds.

MCI Mail has divided its users into two major groups: basic and advanced. Basic service, the less expensive of the two, is automatically assigned to a new user; it includes full menus and prompts in response to commands. Advanced service, by eliminating the menus and simply offering a command prompt, allows more experienced users to string together commands. It also offers expanded electronic and hardcopy mail services. Users must apply to MCI Mail in order to switch from basic to advanced service or back again; the changeover usually takes about 24 hours.

You sign on by giving first your user name (which appears on screen) and then your password (which doesn't). MCI Mail then runs a welcome message consisting of a short MCI Mail update and two news headlines. These headlines act as both information and advertising since they are followed by a suggestion to type `/NEWS` on MCI Mail's Dow Jones function.

You are then informed of any messages in your Inbox. MCI Mail uses terminology geared toward the office worker; mail in the system is divided into several categories: Inbox (for waiting mail), Desk (which holds letters that have already been read), Draft (which holds unfinished outgoing mail), and Outbox (which contains copies of mail sent to others through MCI Mail). Except for the Inbox, which holds mail until you call for it, mail under the basic service will be held for up to 24 hours, and under the advanced service, up to 5 days.

Basic-service users then receive the main menu, which gives a choice of Scan,

which offers a summary of incoming, outgoing, and draft messages; Read, which shows requested messages screen by screen; Print, which displays messages nonstop in order to expedite uploading; Create, which initiates a new message; Create List, which allows users to make a

*The primary function of electronic mail services is to act as a centralized clearinghouse for electronic messages.*

list of message recipients; Dowjones, which gives access to the Dow Jones News/Retrieval database; Account, which adjusts the terminal display; and Help, which is available throughout the system and automatically addresses the command that was most recently accessed. Ad-

vanced-service users simply receive a command prompt instead of this menu.

EasyLink users are supplied with several identifying codes that have to be input at the first prompt in a specific format: terminal type, EasyLink ID, user name, and password. You are also assigned a numerical mailbox address, a telex and answer-back number, and a Western Union billing account number. While you don't need the mailbox address to sign on, you will need it in order to send a message.

Like MCI Mail, EasyLink offers two on-screen modes: command and prompt. Unlike MCI Mail, there is no difference in cost or services between the two modes; the latter simply provides full on-screen menus instead of the PTS prompt that signals the system's readiness to accept commands. To access functions in the prompt mode, you type `/PROMPT` at any time to go into the menu-driven mode; once in the menu system, you can return to the command mode at any time, as well.

After sign-on is complete, you immediately get the PTS prompt. If you choose to view the corresponding menu, you are given seven numbered options: you can send a message, forward (resend) a message, get your mail, disconnect or exit to other services (such as EasyLink's FYI news service or on-line Telex service), get guide-

**MCI Mail**

Type `//NEWS` on Dow Jones for Details.

MCI Mail Version 3.0

There are no messages waiting in your INBOX.

Press `(RETURN)` to continue

You may enter:

SCAN	for a summary of your mail
READ	to read messages or lists
PRINT	to display messages nonstop
CREATE	to write an MCI Letter
CREATE LIST	to make a distribution list
DOWJONES	to Dow Jones News/Retrieval
ACCOUNT	to adjust terminal display
HELP	for assistance

Command (or MENU or EXIT): \_

F1-Help
F2-Print
F3-Disconnect
F5-Send
F6-Exit

After scrolling past the day's headlines, subscribers to MCI Mail's basic service see this menu of options. Advanced users skip the menu and type their choices at a command prompt.

lines for using EasyLink without prompts, get help, and leave the prompt mode and go to the command mode.

ECHO is accessed through the BTS networking system, so you must go through a series of five prompts, including an ID and a password, in order to gain full access. Once you are on the system, a

numbered main menu gives you a choice of Communications (electronic mail), Information (the BBS system and the user directory), Utilities, and the ECHO Hotline, where you can leave comments or recommend other users.

Like EasyLink, ECHO easily toggles from a fully menu-driven mode to a quick

prompt mode. The level can be changed on-line from ECHO's utility system and is effective immediately; however, a user in the menu-driven mode who begins typing in commands rather than numbers will automatically be asked whether he or she wants to use the quick prompt mode.

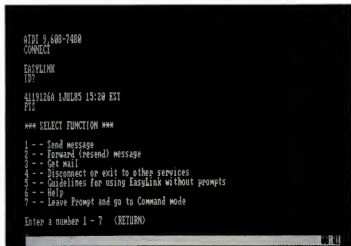
Using ECHO's or MCI Mail's menu or command modes makes little difference in the amount of time needed to process a command. Both services respond almost immediately to most commands; the longest waits (5 to 15 seconds) occur in the process of sending a message.

EasyLink is another story: Its prompt mode adds an enormous amount of waiting time. I found myself sitting impatiently for an average of 30 to 90 seconds between command prompts, a process that could add from 5 to 15 minutes to my on-line time. While things went considerably faster in command mode, I still occasionally found myself on hold; for example, after finishing a letter, I clocked 1 minute, 30 seconds, before the prompt reappeared. This delay could become a serious problem for a heavy business user—especially since the subscriber is charged by the minute. It can be solved by using a separate software package, called *EasyLink Mail Manager*, that is marketed with EasyLink. The software allows users to prepare their material ahead of time and thus streamline the on-line process (see sidebar, "Softening the Work").

### Getting a Letter Off

Sending and receiving electronic mail are really what these systems do best. All three contain simple word processing systems that allow users to key in messages on-line and do some very basic editing.

You are first asked whom you want to send your message to. MCI Mail is the most flexible in this regard. At the TO prompt, you simply type in a name, ID number, or prepared list name, and MCI Mail searches its records for a match. If it finds more than one, it automatically generates a listing of possible recipients along with their companies and cities. You then can choose one of those listed, type in an address (for paper mail), or cancel the operation. If it doesn't find a name you type in among its list of subscribers, the system will assume that you want to send that per-



EasyLink gets down to business by presenting a PTS prompt and waiting for a command. By typing /PROMPT any time while on-line, you can toggle into the menu mode above.



ECHO uses simple numbered menus in its electronic mail system; more advanced users can switch on-line to a quicker command-driven mode. The option to log off is always available.

## SOFTWARE SPEEDS THE MAIL

*Two programs, Instant Mail Manager and Mail-Com, offer EasyLink and MCI Mail users a soft solution to the often confusing tasks of signing on and working with electronic mail services.*

Most electronic mail systems try to make things as easy as possible for their clients, but several software companies feel that things could be even easier. They've created communications packages specifically to increase the efficiency and the use of these systems.

### EasyLink IMM

*EasyLink Instant Mail Manager (IMM)* is so closely identified with Western Union's EasyLink system that it's touted in EasyLink's literature and comes in a binder almost identical to the EasyLink manual. The link is not surprising, since IMM manages to overcome EasyLink's most frustrating problem: time lag. Its secret? The program creates formatted batch files that throw all the necessary information at EasyLink at once and thus bypass the irritating waits at each prompt.

IMM is set up to get you in and out of EasyLink with as little bother (and interaction) as possible. Each of six sections—a basic word processor that is a huge improvement over EasyLink's, a facility to create address lists, a message file management system, the on-line communication facility, the system set-up, and a communications facility through which you can communicate with other hosts—contains several layers of specifically labeled screens.

To set the program up, you go past several fully prompted menu layers to establish your modem type and parameters, which electronic mail system you are accessing (you can set IMM for other systems as well), and the sequence that will dial the number, enter your IDs, and get you past the various prompts to the main part of the system.

IMM's word processor, much better than EasyLink's prehistoric system, is a

neat little program that may not be *Word-Star* but does enable you to perform a number of writing and editing functions easily. The program appends each filename with a .DAT suffix, and it will accept most text files as long as that suffix is present.

IMM's Address List facility enables you to create preformatted lists of up to 100 entries that include the recipient's name, group, company, address, phone number, and EasyLink and telex num-

**I**nstant Mail  
Manager gets you  
in and out of EasyLink  
with little bother.

bers. If you have a single list containing more than 100 names, IMM's manual suggests using EasyLink's RediList function (which stores up to 250 names) and then treating that list as a single entry. Using the Address List facility, you can enter, print, revise, or delete separate list entries or groups of them.

The file management program manages files that have been either prepared for or received from EasyLink. From here, you can view, print out, rename, or delete a file.

From the On-line menu you have four choices: send messages, receive messages, unattended send and receive, or terminal. To send a message, you are asked to specify the message file (a carriage return will bring a list of all avail-

able .DAT files), the address list, the individual, or the group that you want to send it to, whether an attention line should be included, and various other specifications. If requested, IMM will record a sent message using its Log facility, which creates and/or appends a file containing information on each message sent, including the date, times, recipients, message file, batch number, and whether it was successfully sent. And while you can specify to send your message in the various ways available in EasyLink, the type of message function also contains a default value, which automatically sends the recipient an electronic message if it finds a mailbox number, a telex if it finds a telex number only, or a Mailgram if it finds neither.

Once you initiate the Send Message function, IMM quickly takes you into EasyLink and past all the waiting periods. It took me less than a minute to send a short message to a list of three parties, one with a mailbox and two without. The program logged in the message nicely and returned me to the Send Messages menu in about 45 seconds. At this point you are still on-line to EasyLink, as a timer in the lower right-hand corner of your screen attests. You can choose to receive mail (a process that also took under a minute), go to the Terminal function to contact EasyLink directly, or hit F10 to hang up.

IMM also contains a function for unattended send and receive. According to the manual, subscribers who want to access EasyLink during the less-expensive off-peak hours use this function. Again, well-presented prompt menus give all the information you need, and when I sent a message using the function, the program obediently went into action at the specified time, went on-line and off-line with a minimum of fuss, and presented me

with the log of the transaction as soon as I let it know I was back.

*Instant Mail Manager* is, altogether, a very neat and efficient communications program that is actually a necessity for anyone who wants to use Western Union's EasyLink. Of course, an experienced user can probably create equally efficient batch files using a reasonably good word processor and communications program, but when you can get *IMM* for \$35, why bother?

#### Mail-Com

A similar product called *Mail-Com* has recently surfaced for use with MCI Mail. *Mail-Com* is like *IMM* in that it helps users prepare messages and address lists and send and receive electronic mail without much user interaction.

Taking its cue from MCI Mail's "desk" organization, *Mail-Com* presents you with an electronic schematic of a desk on screen, including an in-box, an address book, a disk manager, a send-box, utilities, services, drafts, and waste, all of which are accessed through moving a highlighted prompt. To create a message, you use the Drafts file, which contains a decent word processor, a header display, which enables you to specify the type of message you are sending, and a drafts address display, which keeps track of the number of recipients, copies, and types of letters you are sending.

This latter function is a very handy one, and one of the few ways that *Mail-Com* differs from *IMM*. Once you choose the address list (created previously in the Address Book file) that you wish to use, you page through each name on that list and decide whether you want a message sent to that person, and if so, under what MCI Mail format. You can also type a name directly into the program.

When you start to actually create text, you are switched to *Mail-Com*'s word processor, which is not a very sophisticated one but certainly adequate for most needs. As with *IMM*, you can transfer an existing text file for use by the program. You will get a warning notice if any lines

are over 79 characters long; however, changing the margins doesn't seem to make the text reformat.

Once your message is complete and you have chosen which recipients you want to send it to, you transfer the draft to the send-box. If any necessary information was left out, the status of the letter is listed there as incomplete. Otherwise, you can toggle the message as either Ready or Hold (which means that the letter won't be sent during that transmission). Thus you can send several letters during a single transmission.

Once your messages are labeled ready (and you have preset your phone numbers and ID information using the Utilities function), you can then move to the MCI Mail prompt on the "desk."

As with EasyLink's *IMM*, *Mail-Com* moves you through MCI Mail at top speed, sending three letters in about 2½ minutes. You do not have to specify send or receive; both are done automatically. Incoming mail is saved in (appropriately) your Inbox, where each message is listed. You can then choose to either read, print, delete, move (to another part of the program), or reply to the letter. If you delete a message and then change your mind before the end of the session, you can find a copy in the Waste area of the program. If you decide to reply, *Mail-Com* will automatically address your response and place it in the program's Sendbox.

Incidentally, those users who want to access the Dow Jones News/Retrieval service or do any other MCI Mail business will find that *Mail-Com* takes them in and out of MCI Mail without pausing. Any more interactive tasks have to be undertaken separately through *Mail-Com*'s Services function. This enables you to use *Mail-Com* as a general communications program for MCI Mail or other services and includes a memory function that will reply to up to six on-line prompts, uploading and downloading capabilities (including Xmodem protocol), and other functions.

*Mail-Com* also contains a logging fa-

cility, unattended send and receive, and a system of what amounts to electronic file folders in which to store old or extra files that may take up space in the Outbox, but which you still want to keep. (The program treats messages sent to multiple recipients as a single message, and so the *Mail-Com* log shows only the first recipient that the message was sent to. This may not be a bad way to reference messages; however, my first thought was that the message had been sent to only the first address on the list.)

*Mail-Com* is a nicely written, efficient way of moving messages in and out of your MCI Mail mailbox. The question is, How necessary is it? Unlike EasyLink, which is difficult to handle without the proper software, MCI Mail is a relatively quick service that you can usually access without much problem. If you don't mind spending a few minutes each day interacting with your existing communications program, you can probably get along just fine without it. However, if your work involves high-pressure schedules and you want to jump in and out of MCI Mail with a minimum of fuss, you could do worse than pick up a copy of *Mail-Com*.—Barbara Krasnoff

#### PC FACT FILE

##### EasyLink Instant Mail Manager

Western Union Telegraph Company  
One Lake St.

Upper Saddle River, NJ 07458

(800) 336-3797, Ext. 998

(703) 448-8877 in Virginia

List Price: \$35

Requires: 256K RAM, DOS 2.0 or 2.1.

CIRCLE 672 ON READER SERVICE CARD

##### Mail-Com

Digisoft Computers, Inc.

1501 Third Ave.

New York, NY 10028

(212) 734-3875

List Price: \$189.95

Requires: DOS 1.1 with 128K RAM;

DOS 2.0 or higher with 192K RAM.

CIRCLE 673 ON READER SERVICE CARD

son a hardcopy letter and will prompt you for an address or telex number.

EasyLink seems determined to make the process of searching for another user's name as difficult as possible. In order to find out if someone is an EasyLink subscriber, you must exit the mail service and go into a separate directory/information

service. From there, you must specify either the company name, the ID number, or the answer-back number and then return to the mail service.

To begin an EasyLink letter, specify the addressee's ID number, adding a comma to enter additional addresses or a plus sign (+) to signal you are ready to enter text.

EasyLink also allows you to set an alternate address to which paper mail can be sent if there is a delivery problem at the original destination.

One interesting way to streamline EasyLink's system is to use its BATCH command. By entering BATCH at the PTS prompt, you signal the system to expect to

## THE HARD FACTS ON ELECTRONIC MAIL

### PC FACT FILE

#### MCI Mail

MCI

Box 1001

1900 M St., N.W.

Washington, DC 20036

(800) MCI-2255

CIRCLE 676 ON READER SERVICE CARD

#### Basic E-Mail Charges

- Individual: \$18 annual mailbox fee; \$.45 for messages up to 500 characters; \$1 for messages 501-7,500 characters; \$1 for each additional 7,500 characters; discounts for one message to many addressees; \$.05/minute for local access through Tymnet; \$.15/minute for using WATS lines.

#### Other E-Mail Charges

- Executive 50: \$18 annual mailbox fee; \$.50/month minimum billing commitment; free advanced mailbox; 5 percent discount on MCI Mail.
- Executive 250: \$18 annual mailbox fee; \$.25/month minimum billing commitment; free advanced mailbox; 10 percent discount on MCI Mail applied to total company account.

#### Hardcopy Mail Charges

- \$.30/each telex minute for telex to MCI Mail number; \$.70/each telex minute for telex to other carrier; \$2 for MCI Mail letter up to 3 pages; \$8 for overnight letter up to 6 pages; \$30 for 4-hour letter up to 6 pages; \$1 for each additional 3 pages.

#### Other Charges

- \$10/month advanced service fee;

graphics registration: \$20 per graphic, renewable annually; mail alert: \$1 per message.

#### Information Charges

- Dow Jones News/Retrieval: standard rates vary according to time and information accessed.

### PC FACT FILE

#### EasyLink

The Western Union Telegraph Company

One Lake Street

Upper Saddle River, NJ 07458

(800) 982-2737

CIRCLE 675 ON READER SERVICE CARD

#### Basic E-Mail Charges

- All usage rates are on a per-minute basis; prices are based on input time for EasyLink electronic mail; hardcopy prices are based on an output time of 40 characters per minute.

- To EasyLink mailbox: \$.20 per address.

• On metro or local access number: \$.35 for 300 baud; \$.50 for 1200/110 baud.

• On WATS line: \$.55 for 300 baud; \$.70 for 1200/110 baud.

#### Other E-Mail Charges

- For WATS Users: \$.20 flat fee for each time a connection is made to EasyLink or FYI; \$.20/minute for mailbox retrieval billed in 6-second units; \$.20/minute for mailbox hold retrieval billed in 6-second units.

#### Hardcopy Mail Charges

- Western Union Telex: On metro or local access number: \$.50; on WATS line: \$.70.

- Other Telex Carriers: On metro or local access number: \$.70; on WATS line: \$.90.

- Mailgrams: First electronic page: \$3; each succeeding page: \$.75; mailgrams to Canada: \$1 surcharge.

- Telegrams: \$.05/word (six characters/word) plus \$.25 service charge.

- Computer Letter Service and E-Com: First page: \$1.50; each succeeding page: \$.50.

- Express Document Service: 2-hour letter: \$.20 for up to 5 pages; \$.50 for each additional page; overnight letter: \$.75 for up to 5 pages; \$.25 for each additional page plus \$1 notification charge.

#### Information Charges

- FYI News Service: \$.65/minute for 110/300 baud; \$.90/minute for 1200 baud.

#### Other Charges

- Beginning with the second month of the subscription, EasyLink assesses a \$25 monthly minimum usage fee and a \$1.50/month rental for each mailbox. An optional annual subscription charge of \$25 eliminates the minimum, and you are billed \$1.50/month rental fee for each extra mailbox.

Volume discounts of 10 percent are offered on all monthly usage in excess of \$1,000, and up to \$100 in recurring charges are waived if monthly usage charges exceed \$500.

receive several prepared messages at one time from your computer.

ECHO also lets you direct your original mail to either a single recipient or a pre-stored group listing. As in EasyLink, if you do not know the recipient's ID code you must go into ECHO's information base in order to find it; however, the process is

much quicker and better organized. Only one recipient is addressed at the top of the message; once you have sent the letter, you can send it to others via the Send menu, either in its original form or reedited.

One problem that afflicts all three systems is their weak editing functions. Unlike word processing software, this editing software doesn't let you work directly on the text; instead, after keying it in, you enter an edit mode. In MCI Mail and ECHO, editing a message is very awkward and time consuming—changes must be specified on numbered lines. While this process becomes easier as you learn the system, it is almost never a good idea to attempt to revise a lengthy message using the on-line editor. (EasyLink avoids this problem by omitting any real sort of editing functions whatsoever! Once you've typed a line and hit the Return key, the only way to change it is to cancel the message and start over.)

Of course, the ideal way to avoid dealing with these editing functions is to upload a previously prepared file. This presents no problem with any of the three systems here, although ECHO requires your communications software to be capable of waiting for a period from the main computer before it sends each line of text, which may present problems depending on the software you are using.

#### Check Your Box

Again, the process of scanning and reading electronic mail does not differ appreciably among the three systems. MCI Mail, EasyLink, and ECHO all have scan functions that enable you to quickly note what mail you have received along with some additional information, such as when it was sent, the number of lines in the message, who sent it, and (in the case of EasyLink and ECHO) a short description of the message contents.

MCI Mail also gives you two separate ways of reading your mail: READ and PRINT. The READ command stops the print scroll after each screen and waits for a carriage return to continue, while the PRINT command scrolls the message continuously. Once a message has been delivered, it passes to your Desk file, where it remains for 24 hours (or 5 days if you have advanced service).

EasyLink has only one read function,

which, in its basic form, scrolls the message fully and then deletes it from your mailbox. Hitting Ctrl-S and Ctrl-Q will stop and restart the scroll. Additionally, while entering the READ (or SCAN) command, you can add specific instructions such as CRT, which will cause the scroll to pause after 22 lines; a specific number of lines that you want the scroll to stop at; or HOLD, which will hold mail for 3 days after it's been read. (Users of EasyLink's help function should be warned that, unless otherwise specified, the help message will also scroll continuously.)

ECHO places all correspondence sent and received under its read function. Upon invoking that option, you are asked to enter the number of the specific message you wish to read. A carriage return will take you to the directory, which will prompt you for either mail sent, mail received, or specific pieces of mail. On answering the prompt, you will receive a scan of all the mail you requested. ECHO messages stop automatically between screens; at present, there is no available continuous-scroll option.

An interesting function in ECHO's directory allows you to scan specific mail, that is, mail sent to or received from a specific group or sent or received during a specific month. And, unlike either MCI Mail or EasyLink, ECHO doesn't erase mail that has been read. Instead, it stores it on what it calls your ECHODisk—the amount of ECHO memory available to you as storage space. At any time, you can erase mail that has been stored; if you don't, eventually you will run out of memory space and will have the choice of either paying for an increase in available memory or deleting existing files.

#### Mass Mailing

One of the most important business uses of an electronic mail system is to accommodate long mailing lists. This gives subscribers the ability to quickly and easily issue interoffice memos to large numbers of employees, provide immediate updates to salespeople around the country, and issue informational notices to clients. In order to be reasonably efficient, these systems should allow for relatively accessible input and use of addresses; a well-planned system would give subscribers the option

There is a 40 percent off-peak discount for domestic EasyLink Mailbox and telex traffic transmitted between midnight and 7 a.m. EST on weekdays and all day weekends and holidays.

### PC FACT FILE

#### ECHO

4739 Alla Road  
Marina del Rey, CA 90291  
(213) 823-8415

CIRCLE 674 ON READER SERVICE CARD

#### Basic E-Mail Charges

• If using own local or long-distance phone service: \$10/month.

• If using ECHO network number: Prime time rate (7 a.m.–6 p.m. weekdays): \$8/hour for 300 baud; \$10/hour for 1200 baud. Nonprime rate (6 p.m.–7 a.m. weekdays and all day weekends and holidays): \$4/hour for 300 baud; \$8/hour for 1200 baud.

#### Hardcopy Mail Charges

• ECHO-Express Letter: \$1.75/page for 1–249 pages; \$1.60/page for 250–499 pages; \$1.50/page for 500–999 pages; \$1.40/page for 1,000–2,499 pages; \$1.10/page for 2,500 pages or more.

• ECHO-Express Pak: \$2.00/page for 1–249 pages; \$1.80/page for 250–499 pages; \$1.65/page for 500–999 pages; \$1.50/page for 1,000–2,499 pages; \$1.35/page for 2,500 pages or more.

#### Other Charges

• Memory in ECHODisk storage system: First 212,000 characters are free; after that, storage is sold in blocks of 212,000 characters at \$.20 per day per block.

of choosing categories out of a large list (for example, specifying a certain department and sending the message to everybody in that department).

EasyLink's listing service, RediList, requires a separate arrangement with Western Union. Up to 250 addresses can be stored in a list, with each address assigned a customer-chosen code. The lists are updated by posting changes to a special EasyLink mailbox.

MCI Mail's listing function is accessed through its CREATE LIST command. After typing in the list name, you can type in names and (if the recipients are not MCI Mail subscribers) addresses. The addresses must be input directly, uploaded from a preexisting file.

ECHO also allows you to create a group list from its main Communications menu. From the Group Functions menu, you can request a list of existing groups, get a list of the various IDs in a specific group, create a new listing, or modify or remove an old one. To create a listing, you simply type in the various ECHO IDs after the group name. This function only works for ECHO's electronic mail subscribers.

#### Hardcopy Facts

In the race among electronic mail systems, the more subscribers a system has, the more subscribers it attracts. After all, if a large percentage of the companies you deal with are subscribers to a system, it makes sense to sign onto that system. So in order to attract customers, the systems are continuously streamlining their electronic mail services, adding to their hardcopy services, and offering additional news and database options as well.

For example, users of MCI Mail's electronic mail have options to send messages on a priority basis, receive notice that the message has been read by the other party, and arrange for an operator to notify the recipient that a message is waiting. On the hardcopy front, MCI Mail will send first-class letters from a post office near the address location, overnight and 4-hour courier-delivered letters, and domestic and overseas telexes. Users also have the option of registering letterheads and signatures to be laser-printed onto stationery.

While EasyLink's electronic mail services aren't quite as varied as MCI Mail's,

its link to Western Union does give it an advantage on the hardcopy front. Subscribers to EasyLink have a choice of sending telexes, Mailgrams, telegrams, cablegrams, messages to InfoCom Stations (private networks of telex-type terminals), E-Com letters (computer-generated letters delivered within 2 business days), and express documents that will be delivered within 2 hours to most major cities and overnight to other communities. EasyLink

*In the race  
among electronic  
mail systems, the more  
subscribers a system has,  
the more subscribers it  
attracts.*

also allows users to create their own referencing system, to traffic EasyLink costs to various company departments, and to receive daily reports of EasyLink activity connected with specific IDs.

ECHO is the newest system and so has, to date, the fewest send options. Like MCI Mail, ECHO allows users to receive confirmation that a sent message has been read, and there is also a hardcopy option that enables users to send their messages via first-class mail in either business or large-size envelopes. ECHO hopes to offset its relative lack of extras through the speed and "friendliness" of its system and competitive pricing. Other options include the ECHODisk storage system, on which users can store programs, information, and personal databases and make them accessible to colleagues; the *ECHO Software Catalogue*, which offers 15 best-selling business software products to subscribers at reduced prices; and a bulletin board system covering various business- and computer-related topics. There are also plans to introduce an 800 number for high-speed transmissions of up to 4800 baud.

#### Information Databases

While neither EasyLink nor MCI Mail offers a bulletin board, they both offer access to news and information databases. Western Union has created its own service called FYI, which contains a wide selection of world and financial news, transcripts of speeches and news briefings from Washington, weather reports, and a variety of human-interest topics, including a report from *Consumer Reports* magazine, horoscopes, and daily passages from the King James version of the Bible. A plus here is that subscribers can arrange for specific reports from FYI (say, Friday's closing stock prices) to be "delivered" to their EasyLink boxes on whatever schedule they wish.

MCI Mail has made arrangements with the Dow Jones News/Retrieval service to provide access to that service directly from MCI Mail. Besides an extremely comprehensive array of financial information, Dow Jones offers access to *Grolier's Academic American Encyclopedia*, world and national news, movie reviews, sports and weather reports, an electronic shopping service, and transcripts of the "Wall Street Week" television program. (It should be emphasized that this is not a free service provided to MCI Mail subscribers but is subject to normal Dow Jones News/Retrieval service charges.)

#### Conclusion

MCI Mail, EasyLink, and ECHO all deliver on their basic promise of quick electronic mail delivery. MCI Mail offers the most-comprehensive services in the most efficient manner and has been more successful than its competitors at making a name for itself. EasyLink, though, offers a great deal to corporate users with its many hardcopy options and customized billing services—assuming that users have the software necessary to overcome its irritating time delays. ECHO seems more geared to individual or small-business subscribers for whom price is a strong consideration; however, its memory storage system can also be very useful to those who want to make their own computer files accessible to colleagues. What is the "best" choice turns out to be, as in so many cases, a matter of your own company's needs and preferences. ■

# GRAND · DESIGNS

## on the One-Computer Work Space

As computer use becomes increasingly widespread, we need to consider the human factor. Today's workspaces are generally simple, gadget-free, and designed to reflect the way we work.

**Y**ou can reap the rewards of PC use for only so long before you begin to notice the physical side effects. And it's not the machine that's coming down with the symptoms, it's you. That peculiar pain between your shoulder blades won't go away, and stars are dancing before your eyes, long after you've unglued yourself from your monitor. Add to this mortification of the flesh a paper-cluttered work space, a desk-top that's too high for typing, a neighbor who's too noisy, and a printer that won't stop clattering and the picture is grim indeed.

As we use our computers more and more intensively, we need to think beyond our software and hardware and consider the human factors as well. Human factors engineering, or ergonomics, is based on the idea that tools and furniture should be designed to complement the way people work, rather than to force people to adapt to the equipment and its surroundings. Researchers have found that people who use their computers for more than 2 hours a day benefit greatly from ergonomically "correct" workplaces.



Driven by the ergonomic itch, PC's editors went looking for the well-designed work place. Our quest took us across the country. En route we talked to the design experts, the decision makers, and, most importantly, the employees who use computers day in and day out. While the sites we looked at varied widely, we noticed a few common threads. The first is that today's computer work spaces are generally simple and gadget-free, and the second is that they are generally not hardware or applications

specific—a sensible solution since both companies and technology continually change and grow.

The three single-computer workstations we chose were all, coincidentally, in San Francisco. Each one represents a different ergonomic value and, at the same time, is representative of our overall findings.

Writer Howard Rheingold describes and shows you these three sites. Following his grand tour, Jane Wollman reports on the special design considerations for a multistation network at Procter & Gamble's new headquarters in Cincinnati, and Dara Pearlman takes the "going-it-alone" route.—Jennifer de Jong

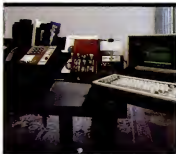


**A**ny company that pays its top executives \$60,000 a year and up and buys them computers that cost \$10,000 apiece but spends only \$500 each on their desks is squandering its most valuable resource: the minds of its best people. That's how designer Bruce Burdick sees the work space problem. He claims that the desk is a tool for people who produce "soft" products like information, designs, decisions, and communications. Since no one had done it to his satisfaction, Burdick

#### A Tool like a Car

The most important concept Burdick wanted the modular, standalone workstation to respond to is his idea that a desk or workstation is a large, intensively used tool, not just a surface to hold other tools. He draws an analogy between automobiles and desks to explain how people have misunderstood the importance of the desk as a tool. "To most people," he says, "Do you like your car?" is a reasonable question, but "Do you like your desk?" sounds

Burdick designed the workstation for people who use the computer to help them think, decide, compose, and communicate, not for those who spend all their time entering data.



set out to create more useful tools for executives—better desks.

The result is the Burdick Group, a \$4,000 workstation that looks like an erector set for an executive. Seven-foot polished aluminum beams and black columns, support black-plastic-laminated work surfaces, pivoting computer tables with keyboard extensions, file drawers, paper trays, display ledges, plant holders, reference organizers, telephone stands, and conference tables.

You can reconfigure a former user's Burdick Group workstation to suit your needs or to accommodate a new project. One beam gives you an old-fashioned straight-line desk, two create T and L shapes, and with three you can make U-shaped and circular configurations. Removable die-cast aluminum brackets join components to the beams in an endless variety of shapes and sizes, and channels in the beams keep wires out of sight and out of harm's way.

*Burdick's office in San Francisco, with the \$4,000 workstation he designed. Is the price too high? No, this desk is an investment in a company's most valuable resource: the minds of its best people.*

strange. Yet you work a minimum of 1,500 hours per year at your desk. Why shouldn't it be functional and nicely designed? A BMW costs \$20,000; this desk costs \$4,000. People use it every hour of their working day, but they use their automobiles for only about an hour a day. The question is, How do you and your company value your performance? If high performance is important, you need a high-performance tool."

Burdick designed his single-person workstation so that a computer could provide that high-performance element. He designed the workstation for people who use the computer to help them think, decide, compose, and communicate, not for those who spend all their time doing word processing or entering data.

Because the intended user doesn't spend all day looking at the screen, Burdick made the computer a focus, not the center, of the work surface. But putting the computer within easy reach was a fundamental design goal, because Burdick believes that the power of the computer as a mind extender diminishes as the distance between the person and the computer increases. The monitor must be readable



from the user's normal position, and the keyboard must be nearby.

Since people don't always work alone, Burdick also wanted to make computers accessible to groups. In his view the computer must become "another chair at the conference table." In his own office he put his round, glass-topped conference table on a beam at one end of a T structure. His desktop is the crossbar of the T, and the computer that is normally at a 45-degree angle to his right when he works at his desk pivots to face the conference table, enabling several people to read the screen.

Like most desk designers, Burdick did not design his work surface so that you could adjust its height. He feels that an adjustable chair is a more economical way to match the level of the work surface to the height of each user. And if you want to raise or tilt the monitor, you must use off-the-shelf equipment from a different manufacturer.

Lamps also mount on the beams. But in Burdick's office, small, track-mounted spotlights on the ceiling add to the indirect lighting. Burdick acknowledges that ergonomically aware designers of office interiors are moving away from using direct lighting toward creating relatively low levels of diffuse light, but he personally dislikes perfectly glare-free, even lighting. He feels it is flat and boring. "There's no tooth and texture to it," he says.

#### The Burdick Group at Work

Richard Sears, chief executive partner of Kwasha Lipton, an employee benefits consulting firm, worked closely with the architect who designed his firm's high-tech office building in Fort Lee, New Jersey, and with Burdick. More than 60 of Kwasha Lipton's top managers use Burdick Groups and personal computers. Unlike those CEOs who disdain the idea of executives, doing word processing, Sears says that "word processing as a creative process is the payback for putting computers on management desks. Computers make it fun to write and compose, and free writers to let their imaginations work."

*At Trowbridge, Kieselhurst & Thomas, a small mortgage banking company, the design reflects the current computer needs and leaves room for expansion.*

Sears uses an L-shaped setup. And he likes a shallow work surface in front of him. "Nobody uses the front of a big desk for anything except calendars," he says. "I want to decrease the distance between my chair and the person I'm talking to."

Sears is enthusiastic about the way the system can be customized to the needs of individual users but admits that once the basic structure of their workstations is set up, the people in his office don't often change it. One other thing Sears values

The architect's first step in planning a project, whether an office or a residence, is to question the people who will inhabit the building about how they intend to use it.

about the Burdick Groups his company owns is their beauty. "Given the overall design of the offices and the building," he says, "the fact that the desks are beautiful to look at is important."

#### Architectural Workstation

The Burdick Group is a designer's idea of a computer workstation, but the computer facility designed by the architectural firm Robinson Mills & Williams for an office in a San Francisco skyscraper is an architect's idea of one. Matthew Mills, president of the architectural firm, considers the work surface to be an important, but not all-important, factor in the design of a room where computers are used. Jim Budzinski, the firm's director of interior design, believes that a workstation should be "as generic as possible," a "plain vanilla" facility that can accommodate future changes in computer hardware and varying patterns of computer use.

The architect's first step in planning a project, whether an office or a residence, is to question the people who will inhabit the building about how they intend to use it. "If you wanted me to design your house," Mills explains, "first I'd ask you how many bedrooms and bathrooms you want, how many cars you have, whether your family wants to be together in a common space after meals or prefers to be separated

into individual rooms. After gathering information through questions and answers, I'd weigh your needs against the size and the shape of the site, the amount of money you want to spend, and other considerations before I began to design your house. A similar process precedes the planning of a computer room or workstation."

The planning process was particularly challenging when Mills's firm was hired to design the offices of Trowbridge, Kieselhurst & Thomas, a mortgage banking company. Trowbridge was moving into a new office on the 28th floor of the San Francisco building that houses Bank of America's headquarters. Robinson Mills & Williams was responsible for the entire design, including the computer room. And, as Budzinski explains, Trowbridge had never used a computer in its business before. So it wasn't sure who would use it, how often or how long it would be used, or even what kind it would be. All its executives knew was that they planned to use personal computers—as soon as they figured out how to integrate them into their work.

#### Let There Be Light

Trowbridge's staff of about ten work closely with one another in the new site, which has a spectacular view of San Francisco Bay and a lot of natural northern light through the 8-foot-high windows of the partners' offices. The view and the light can be seen through the soundproof glass walls that separate the general offices from the partners' offices.

Part of the view from the partners' windows is visible through the glass wall of the computer room, which also isolates it acoustically from the main office space. The 8-foot-6-inch-wide by 12-foot-long computer room houses a work surface that is a simple rectangle, 11 feet long and 30 inches deep, running against the wall that's perpendicular to the outside wall. A slot at the back of the rectangular table holds paper and hides wires. Pedestals underneath the work surface store files, and a general storage shelf overhead holds binders, instruction manuals, disks, and other computer supplies that people need to be able to see and reach.

Low-level, indirect lighting under the shelves adds to the overhead lighting that's

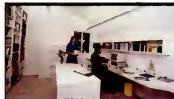


## GRAND DESIGNS

standard throughout the building. The fixtures have special lenses that bend the light in several directions, preventing shadow-forming glare. Because they knew that people were likely to use the computer for extended periods and they couldn't change the building's built-in lighting fixtures, Mills and Budzinski paid particular attention to the "light values" of the furnishings, from the floor covering to the work surface. By using relatively light-colored

day the last 10 days of the month. Wilcox anticipates increasing use of the computer room by the underwriters in coming months. "The lighting, work surface, and seating arrangements work well," she reports. "The only addition I'd like," she says, "is a cabinet to the side of the workstation so that I can work with paper files more easily." Mills's firm is now planning to add such a cabinet.

If you had told Hugh and Ann West at



Work-related problems are better solved by adding accessories to a desk than by building in computer-specific features.

furnishings, they were able to diffuse the less-than-ideal overhead light.

Architect Mills feels even more strongly than designer Burdick that specific work-related problems like adjusting the height and the angle of the computer screen are better solved by adding accessories than by building in computer-specific features. He notes that today's desks are "pretty much the same as they were in Dickens's time." They're still basically platforms for holding media for people to work with, using their eyes and hands as they manipulate words and numbers. A nineteenth-century clerk had specific accessories like a tilted ledger stand, sleeve protectors, and eyeshades. Similarly, today's computerized office worker might want to add accessories to raise or tilt the screen or to adjust the light values of the furnishings to diffuse the lighting. Like Burdick, Mills and Budzinski designed a work surface of fixed height but provided height-adjustable chairs.

The first computer installed in the computer room was an IBM PC; the first person to use it extensively was Vicki Wilcox, the firm's manager of loan servicing. She uses the computer all day the first several days of every month, and several hours a

the start of their home remodeling project that they would spend \$1,000 to reduce the amount of lighting in their home offices, they probably would have laughed. Hugh is an emergency room physician, used to working under 150 footcandles of bright, shadowless light. He is also a writer, using a PC-XT and WordStar to draft novels and medical papers. Ann is an architect who works at her Compaq in their Mill Valley, California home.

When they asked their friend Guy Esberg to help them design new office additions to their house, Hugh had been working directly under a naked 200-watt bulb. "He had a bulb hanging from a wire," confirms Esberg, marketing director of Peerless Lighting, a firm that specializes in low-glare, indirect lensed lighting installations. "Hugh told me about the lighting in the emergency room," Esberg says, "and I told him that we could eliminate shadows with only 25 footcandles. We'd have to spread the light evenly throughout the room by bouncing it off the ceilings and walls and floor."

Hugh West's new office almost doesn't need any artificial lighting; windows line all four sides. And Ann's office has a skylight. But since nature is not a steady light source, tube lighting from Peerless reflects light off the ceilings of both new offices, and white surfaces around the rooms scatter light to create an even level of illumination. The goal is to reduce contrast, since a

*Hugh and Ann West in the newly designed office of their California home. They spent \$1,000 to reduce the amount of lighting and increase productivity.*

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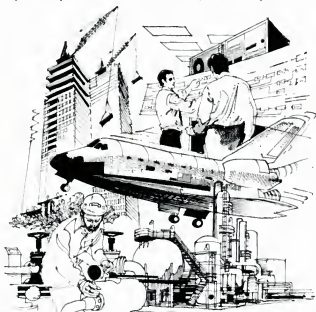
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## GRAND DESIGNS

significant source of VDT-related fatigue is the constant readjustment your pupils and eye muscles must make every time your focus moves between things that have different levels of illumination, primarily the screen and the page.

Used to the bright lighting in the hospital emergency room, Hugh didn't buy Esberg's suggestion that 25 footcandles of light was all he would need; so they compromised and installed double-tube lights to enable him to double the light intensity. But in practice he uses only the lower setting and admits that Esberg's original plan would have offered sufficient light. Ann's lighting needs and preferences were different from Hugh's. "I use a Compaq in my office," she explains, "but I also spend a great deal of time drawing and looking at drawings. So one light is an 'uplight,' while the other, a 'downlight,' directly illuminates my drawing board."

Ann worked closely with the designers of both offices, two professors at the University of California's school of architecture. The simple custom-made furnishings are mostly white. The lower-than-standard work surface in Hugh's office is covered in a matte white laminate, and it's large enough for him to spread his papers around. Against one wall a long work surface is deeper at the center to accommodate the computer. A built-in bookcase lines the opposite wall. This area of the room is generally fairly dark, minimizing glare on the work area. A cushioned, height-adjustable, rolling chair with lumbar support puts Hugh in the center of a U-shaped workstation. A 30- by 60-inch island with a work surface on top and hanging-file storage space underneath is behind Hugh as he faces the computer. His printer sits on a low cart to his left, which he claims makes it easier to read hard copy and to change ribbons and printwheels.

Was it worth it? "Without a doubt," agree the Wests. "I do look forward to coming here. And the room is conducive to work: I've been more productive since I started working here."

*Howard Rheingold is the author of several books, including Tools for Thought: The People and Ideas Behind the Next Computer Revolution (Simon and Schuster, 1985).*

## D · E · S · I · G · N · I · N · G

Your Personal  
Computer Space

If you've been literally breaking your back working on a PC, knowing what to look for in office furnishings should help ease the pain.

Perhaps you have already discovered that getting the most out of your PC takes more than a winning combination of hardware and software or an extra megabyte of memory. No matter how fast your machinery or how smart your programs, if your chair is uncomfortable, if you have a nagging pain between your shoulder blades, or if the glare on your screen makes it difficult to read, your work will suffer.

You need to put your computer in its proper place. Ideally, this proper place is an office equipped with a comfortable chair, a desk of appropriate height, glare-free lighting, and a work area that is tailored to the specific task at hand. These and other considerations like them fall under the category of *ergonomics*, or human-factors engineering. This relatively new science is based on the belief that instead of forcing people to adapt to equipment, designers should adapt tools and furniture to fit people or more specifically, a



particular person.

Ergonomists say, for example, that you will be most comfortable if you can reach the keyboard with your arms flexed at a 90-degree angle. That means that the keyboard should rest on a surface that is 2 to 3 inches lower than the typical office desk. Your monitor should be placed so that the top is roughly even with your line of sight,

and it should be tilted at a slight upward angle so that you can view it with your head inclined at about 35 degrees. Ergonomic computer furniture is designed to comply with these and other guidelines to help you avoid backaches and eyestrain when you work with your PC.

#### The Finance Factor

Factoring ergonomics into your budget can cause financial strain, especially if your bank account is still convalescing from the multi-kilobuck battering of your PC purchase. Outfitting an office with furniture and lighting designed to be PC compatible can easily cost as much or more than

the PC itself. Fortunately, though, there are some cheap fixes that can work just fine, particularly if you don't use your computer intensively.

On the practical level, though, designing a comfortable office doesn't necessarily mean complying with a set of ergonomic guidelines. Whether you're in the market for a state-of-the-art computer of-

fice or just a few inexpensive improvements, professional office designers suggest that you pause and take stock of your needs and work habits. Here are some questions to ask yourself:

- Is my computer central or peripheral to my work? Once you answer this question, a lot of other things fall into place. You can decide if you want your lighting to emphasize paper tasks or computer tasks, if you want your desk at writing height or keyboarding height, and you can determine the importance of a chair that emphasizes good posture.

- What is my budget? While you might be able to completely furnish an office for as little as \$200, (\$80 for a chair, \$100 for a table, and \$20 for an architect's lamp), as your budget goes up, you get higher quality and more features.

- How do I work? For instance, do you work with lots of books and papers? Then you'll want to look for a desk that gives you sufficient room to spread them out. Do you type intensively for long stretches? Then good posture support becomes critical. Do you meet with clients or employees in your office? If so, you may want to place the PC to the side of your work area so it doesn't get in the way.

- Do I have any special needs? Do you have space restrictions? Some of the more expensive furniture packs a lot of function into a small space. Do you have vision problems? If so, you'll want to pay special attention to lighting and placement of the display screen.

### Taking Stock

A good way to take stock of your needs is to use your PC for a while with your existing furniture. You'll begin to get a picture of what working with the PC is like and what the drawbacks of your workspace are.

Armed with that knowledge, you're ready to seek design advice. Putting together a computer workspace can be as formidable a task as choosing your computer in the first place, so it's wise to get some expert help. Although designers and consultants charge hefty fees and are often not interested in small jobs, there are some low-cost resources for the do-it-yourselfer. For general guidelines, you can go to your public library and look up articles on com-

puter workplaces in back issues of office automation, computer, and architectural magazines.

In order to obtain more personalized advice, you can go to furniture and lighting stores. Furniture retailers that carry the major business-furniture brands, such as Steelcase, Herman Miller, and Hayworth, often have designers on staff who can help you, either for an hourly fee or as part of the price of the furniture. Similarly, lighting stores that carry a wide range of fix-

**Putting together a computer workspace can be as formidable a task as choosing your computer, so it's wise to get help. Although consultants charge hefty fees, there are low-cost resources for the do-it-yourselfer.**

tures—fluorescent, incandescent, floor, ceiling, and table lamps—are often prepared to give you advice on how to design your lighting.

If your budget is on the high side, say more than \$1,000 for lighting and several thousand for furniture, you might want to use the services of a professional office designer or lighting consultant who can help make sure that you get the most out of your workplace investment. With these considerations in mind, let's take a look in some detail at the major components of your work area.

### Sitting Down on the Job

If you only have enough money to improve one part of your office, the best place to spend it is on your chair. The right chair probably has more influence than any other component of your office in determining whether you can work comfortably at your PC for long stretches. "Just about everything you do in your office, you do from your chair," explains Don Korell, research director for Steelcase, Inc., the country's largest manufacturer of business furniture. "If the chair is right, you have a very good start at being comfortable."

According to Dan Peak, spokesman for Herman Miller Corporation, which plays Avis to Steelcase's Hertz, the newer, ergonomic office chairs are more comfortable than older chairs because they can support the body in a number of different positions. They help you maintain good posture when you're sitting upright at the keyboard and allow you to lean back and stretch, as well. His company's Ergon chair, introduced in 1975, claims to be the first office chair to apply this multiple-position principle. It is, says Peak, the best-selling chair in the industry, with some 1.5 million in use.

When you're shopping for a chair, here are some of the features to look for:

- Waterfall edge: A sloping-front seat edge doesn't interfere with circulation to your lower legs.

- Five-star base with casters: This base is better than the older, four-star models because its prongs are shorter, and the chair is more stable.

- Adjustable seat height: If several different people use the chair, or if you plan to work at surfaces of differing heights, consider a gas-lift mechanism that allows you to adjust the height while you're seated. Otherwise, you can save money and buy a chair that allows you to adjust the height before you sit down.

- Adjustable backrest angle: This lets you to lean back and stretch. Some chairs come with a push-button lock that keeps the backrest at the angle of your choice. This lock is especially helpful if you need support for an upright position when you're going a long bout with your PC.

- Separate seat tilt: More-expensive chairs allow you to lean back while the seat tilts only slightly. This feature keeps your feet from lifting off the floor while you're reclining.

- Short armrests:

There is no real agreement among the experts as to the desirability of armrests. Some hate them, and some wouldn't do without them. If you enjoy resting your elbows while you're typing or thinking, look



for half-length armrests so you can pull your chair up to the desk.

If you're feeling the effects of an ill-fitting chair, but you lack the ready cash to move up to an ergonomic office chair, you can still improve your lot. An inexpensive (around \$30) upgrade is a lumbar support cushion, usually available in orthopedic supply houses, that can turn an uncomfortable chair into a passable chair.

For a little more money, between \$80 and \$150, many office-supply stores will sell you a secretarial chair with lumbar support, casters, and height adjustment. As the price goes up, the chair will be more adjustable and have more features. The major office furniture manufacturers have full lines of office chairs ranging from around \$200 to \$1,000. At the lower end of this price range are secretarial or task chairs with small backrests and few features. At the high end are executive chairs with lots of features and lounge-chair-size backrests. In between the two are the operator's or programmer's chairs, usually in the \$400 to \$500 range. The backrest typically comes up to the shoulders, and it allows you a wide range of sitting positions.

A good chair is a lot like a pair of shoes: You have to try it on and wear it for a while before you can decide that it fits. Researcher Korell suggests that you take your time when choosing a chair and try it out in a showroom where you can simulate your own working environment.

### The Deskjob

The PC and its peripherals, printer, modem, mouse, and so on, need a lot of real estate. And when this electronic menagerie takes up residence on your desk, it can make a once roomy work surface seem way too small.

That's the problem social-science author Carol Tavris faced when an Eagle PC took up a roost on her desk. Until then, she had worked in a corner of her living room at a typical "graduate student's" desk composed of two file cabinets bridged by a slab of wood. Her typewriter was perched nearby on a typewriter table. Although the PC was in many ways a functional replacement for her typewriter, it ate up far more space. In fact, the PC took up so much space that Tavris found she no longer had room for her reference materials. Tavris

found this problem doubly vexing because she wanted to fit her PC and its bulky printer into a corner of her one-bedroom New York apartment. And since her work area was in her living room, she wanted it to look nice. "I looked at ready-made desks, and none met my practical and aesthetic needs. Some computer-desk makers assume that now that you have a computer, you'll never need to write a check again. There's no space for writing, no storage. I also found nothing that hides the printer

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yet gives easy access to it."

Her solution was to commission a custom-built desk from designer Howard Helene, a partner in Techne Design of North Bennington, Vermont. It set her back \$2,800, but she swears it was worth it. Made of lacquered tropical hardwood, the desk is 64 inches wide and 24 inches deep, so that it fits her limited space. It includes pull-out storage for her printer, two file drawers, and a box in the back that holds a surge protector and hides the PC's cables. And best of all, it has two pull-out shelves, similar to kitchen cutting boards, that allow her to spread out her papers on either side of her work area. "This is bliss," she says.

There are, of course, less-expensive ways to give your PC a comfortable home, if you don't have Tavris's special needs and limitations. The cheapest solution is to adapt what you already have. For instance, if you have a classic, L-shaped desk with a typewriter return section, you might have thought about putting your PC on the typewriter section—until you discovered that it didn't fit. However, if you bolt a new, deeper desktop onto the typewriter return, you'll have room for your PC and the key-

board will be at the recommended height.

The height issue is more problematic if you want to use your PC on a standard-height office desk, since the optimum height for typing is 3 inches below the optimum height for paper-handling tasks. But, before you start sawing off the bottom 3 inches of your desk's legs, take stock of your work habits. Researcher Jon Ryburg recommends that you select a desk height based on your dominant desk activity. If you work at the keyboard most of the time, you'll probably be more comfortable if your desk is at typewriter height, between 25 inches and 31 inches high, depending on your own height. If you do paperwork most of the time, you should choose a desk 2 to 3 inches taller. And, if your work is an even mix, Ryburg suggests that you choose a compromise height, part way between the optimum typing height and the optimum paperwork height.

One possible way to get the best of both worlds is an articulating keyboard arm, an adjustable keyboard shelf that retails for between \$200 and \$300, bolts to the underside of your desk, and slides out and locks into place at any height you choose. Unfortunately, these devices are not problem free. Ryburg points out that when the keyboard is stowed under the desk, it can interfere with leg movement, and when it's pulled out, it makes you sit almost a foot back from your desk, forcing you to crane your neck to see your work papers. Ryburg thinks keyboard arms work best for "dedicated users," people who work at the keyboard most of the time and won't stow it under the table too often.

### On a Low Budget

If you'd like to buy a new desk for your PC, there are some low-budget alternatives as well. Many office supply stores are beginning to carry what are essentially large typewriter tables, deep enough to hold a PC, for as little as \$100. This gives you a place to put the computer, but leaves a host of other problems unsolved, such as where to store other peripherals, how to organize cables, and where to put related paperwork. You get a bit more room for storing equipment if you spend about \$300 at an office-supply store for a mass-produced computer desk. Such desks, often in steel or particle board with wood veneer,

are usually at average typewriter height and often come with a hutch where you can store peripherals.

A major drawback to many of these budget computer desks is, as Carol Tavris pointed out, a serious lack of storage space. They have no drawers for pencils, no file drawers—only storage for disks and perhaps a pull-out shelf for the printer. And if you want surface space for paperwork or help in keeping the cables out of sight, forget it.

For those features, you'll have to pay quite a bit more, either by ordering a custom desk as Tavris did or by shopping at a contract furniture store that specializes in office interiors.

One such store in the San Francisco area is Rucker Fuller, which sells furniture to the likes of AT&T, Crown Zellerbach, and Bank of America. When I visited Rucker Fuller's Santa Clara, California, store, sales manager Dennis Abraham told me that while he tries to keep at least one salesman free for "drop-in" shoppers, it's best to make an appointment if you want to be sure of service.

Abraham showed me a steelcase line of modular desks that allows you to mix and match components according to your needs. You can choose the kind of drawers you want and the size and shape of the table tops. The height can be adjusted in 1-inch increments, and the desks include pop-out side panels where you can hide your PC's cables. Of course, none of these desks were inexpensive.

For example, I saw an L-shaped adjustable steel desk made with Steelcase components that included two file drawers on one side, three multipurpose drawers on the other, and a 125 degree connecting bridge, ideal for spreading out lots of papers while working. If you bought only one (there's a quantity discount), it would cost \$1,450. If you wanted something similar in wood, you should expect to pay about 20 percent more, Abraham said.

While that price is not exactly in the budget range, it's still a lot less than what you'd pay for a custom desk. More choices may soon be on the market. Howard Helene, the designer of Carol Tavris's desk, believes that the furniture industry is only beginning to tackle the problem of producing good-quality computer furniture.

"We're going to see a lot more-competitively priced and better-designed pieces coming on the market, probably within the next year," he predicts.

As a custom furniture designer, he views the prospect enthusiastically. "Someone will see a feature he likes in piece A, and another feature he likes in piece B, and then he'll come to me, and I'll put the best parts together."

#### The Right Light

"When we were kids, our mothers said, 'The more light the better,' even if it was blinding you. But more is not necessarily better, especially with computers."

More-competitively  
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designed pieces will  
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market, probably  
within the next year.

That, according to Guy Esberg, director of marketing for Peerless Electric Company of Berkeley, California, is the crucial point for do-it-yourself lighting designers to understand. The kind of lighting you install is more important than how much.

Lighting consultant David Malman, owner of the San Francisco lighting design firm Architectural Lighting Design, cites his three main rules of thumb for ensuring the proper light quality in your computer office:

- Position the display screen so that neither you nor the screen is in line with a potential glare source, such as a window. If the screen faces a glare source, the reflection can make it almost unreadable. If you face the glare source, the contrast between the dark screen and the bright light can cause eyestrain.

- Ambient electric light should come from low-glare fixtures. One way to minimize glare is to bounce the light off of a wall or ceiling. However, Malman cautions that "up-lighting by itself is not the magical solution."

For instance, a very tall torchier lamp that throws its light onto a low ceiling can create a hot spot just as bright as that of a

bare bulb. Another way to cut down on glare is to make sure that any direct lighting is well shielded, so that no exposed bulbs can be seen by you or reflected by the screen. Thus, you could use deeply recessed lights or fluorescent fixtures shielded by louvers.

- Task lighting should be adjustable in brightness and position. "Few devices are as ugly or effective as the architect's desk lamp," Malman notes. You can adjust the brightness by pointing it partially toward a wall and partially toward your task. Most people, Malman adds, tend to point the lamp toward the corner, so that paper-based tasks are lit softly, with no glare.

With these light-quality issues in mind, you should now consider light quantity. Professional lighting designers can determine that need for you, but you might be reluctant to pay their fees, which range between \$60 to \$120 per hour.

Peerless's Esberg suggests that if you have a small lighting project, you should take your questions to a lighting retailer. If the store handles a wide range of fixtures, it will probably have someone on staff who can be helpful.

Before you go to the store, Esberg recommends that you take stock of your existing lighting and decide if it's too little or too much. For instance, you might decide that your room, lit by three 100-watt fixtures, is too dim. Then, make a note of your room's dimensions, including height, and describe its windows in terms of size and exposure. You'll also want to write down the color of the walls, ceiling, and floor. "Go into the store armed with that," Esberg says, "and tell them what you'll be doing in the room. Will you be working mostly during the day or at night? Will you be working primarily with the computer or with paper? Then, take a look at the fixtures that the store consultant recommends and see how comfortable you are with them."

Ultimately, like your desk and your chair, good lighting considers your own needs and comfort. Put them all together, and you'll have a comfortable workplace, where you won't tire as easily and where you'll work more productively. ■

*Dara Pearlman is a frequent contributor to PC Magazine.*



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## Furnishing Information

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### NORTHEAST:

**Atlantic Cabinet**  
P.O. Box 100, Interstate  
Industrial Park  
Williamsport, MD 21795  
(301) 223-8900

**AVM Data Products**  
43 Jefferson St.  
Ellicottville, NY 14731  
(716) 699-2361

**Bush Industries**  
312 Fair Oak Street  
Little Valley, NY 14755  
(800) 228-BUSH  
(716) 938-9101

**Citadel Data Group, Inc.**  
189 Sunrise Highway  
Rockville Center, NY 11570  
(516) 766-7331

**Computerise, Inc.**  
47-09 30th St.  
Long Island City, NY 11101  
(718) 786-9100

**Dennison Monarch Systems Inc.**  
P.O. Box 4081  
New Windsor, NY 12550  
(914) 562-3100

**Global Computer Supplies**  
45 S. Service Road  
Plainview, NY 11803  
(800) 8GLOBAL  
(516) 792-2299

**Human Factor Technologies**  
P.O. Box 235  
55 Harvey Road  
Londonderry, NH 03053  
(603) 432-4495

**IBM Corp. Workstation Products**  
P.O. Box 10  
Princeton, NJ 08540  
(800) IBM-2468

**Misco Inc. Computer Supplies**  
1 Misco Plaza  
Holmdel, NJ 07733  
(800) 631-2227

**Rudd International**  
1066 31st Street, N.W.  
Washington, DC 20007  
(202) 333-5600

**Techno Design**  
BCIC Building  
North Bennington, VT 05257  
(802) 447-2407

### MIDWEST:

**Acco International, Inc.**  
770 S. Acco Plaza  
Wheeling, IL 60090  
(312) 541-9500

**Advance Products Co., Inc.**  
P.O. Box 2178  
Wichita, KS 67201  
(316) 263-4231

**All-Steel Inc.**  
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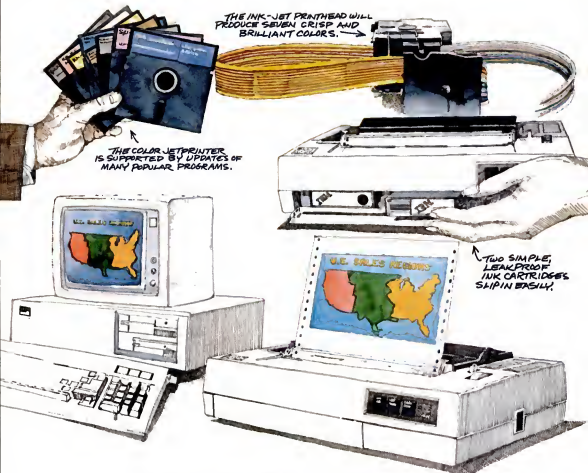
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## Tomorrow's Office

Soapsuds giant Procter & Gamble spent 2½ years researching employee needs before designing the interior of its new Tower Building. The result is an ergonomic wonder.

From sea to shining sea few corporations operating multistation personal computer networks do so in work environments that work. Companies invest thousands, even millions, of dollars for personal computer systems but don't bother to ensure that they reap the cost-benefits of such complex modern systems: they don't design each workspace to enhance worker productivity; they fail to address the design issues of glare-free lighting, correct positioning of the computer in relation to the work area, privacy, noise control, sufficient work surface at the right height, correct seating, and cable and wire management.

They may spend a lot on office design, but they seldom get what they really need. They invest primarily in aesthetics, creating office space that is beautiful to look at but difficult to work in. Even in today's computer-reliant, high-tech work environment, many companies that are willing to invest in workplace design remain essentially ignorant of ergonomics.

But a few companies throughout the land are beginning to see the light. One corporate giant has given computer ergonomics high priority in the design of its new world headquarters—Procter & Gamble. The Cincinnati-based maker of Tide, Charmin, and Crisco, among other household names, is, in fact, light-years ahead



*The newly designed offices in P&G's Cincinnati headquarters rely on adjustable work surfaces, ergonomic chairs, and indirect lighting to achieve increased worker comfort and productivity.*

of most American corporations in furnishing the proper work environment for a multistation network.

P&G's new 16-story structure, known as the Tower Building, was designed by New York architects Kohn Pedersen Fox (KPF) Associates. It is connected by a bridge to the company's 30-year-old original headquarters, which top management and a number of other employees will continue to occupy. From outside, the two octagonal buildings look like identical twins; inside, however, they juxtapose the "Office of Tomorrow" with the "Office of Yesterday."

Ergonomics experts stress that, when

planning workstations for a large network, the first consideration is the kind of work each employee performs. "Ideally," notes Richard Koffler, president of The Koffler Group, office systems consultants in Santa Monica, California, "you must look at each group of people doing a certain task and design the best workplace to meet those tasks." The Procter & Gamble space was designed according to that principle.

The recently completed Tower totals 800,000 square feet, 500,000 of which is office space. What's unique about the new building is that it has no windowed offices; the perimeter of each floor has been designed as a circulation path, or corridor. Each floor has 200 to 300 workstations, laid out in an "open-office" plan. The workstations are composed of separate work surface and storage module components attached to vertical acoustical panels.

The open-office layout was chosen to facilitate project teams' frequent shifts from workplace to workplace. Randolph H. Gerner, interior architect and a partner in Kohn Pedersen Fox Conway (KPF), the interior design arm of KPF Associates, explains: "P&G considered the person the most important element in the work environment. All furnishings are intended to complement the way people work. We



## TOMORROW'S OFFICE

didn't ask employees to change their work techniques or habits as human beings to suit the equipment or furnishings."

### Seeing the Light

In addition to considering the way that employees worked at Procter & Gamble, KPFC conducted an exhaustive study of employee problems and needs associated with work at the PC. The biggest concern, it showed, stemmed from the existing lighting system. As Gerner recalls, "The employees said, 'We have a problem with glare on the screen—we hate it—and we have to find a better way.'"

At the time, office lighting for most employees at the company's original headquarters and at a series of owned and rented downtown buildings consisted of recessed, ceiling-mounted, lensed fixtures. These bright fluorescent "downlights" created "hot spots," bright, glaring reflections, on the ceiling. These hot spots reflected on the PC displays, making characters difficult to read and causing eye fatigue. P&G tried to help by moving some of the ceiling lights, attaching glare shields to the screens, and installing partitions around several of the workstations, but none of these remedies worked.

According to Gerner, P&G responded to the study by making even distribution of light its highest design priority. KPFC and lighting manufacturer Peerless Lighting, based in Berkeley, California, jointly developed an innovative indirect lighting fixture for each workstation. This horizontal fixture sits on an overhead cabinet 6 feet off the floor and directs light toward the ceiling. The ambient light level produced varies from 25 to 35 footcandles, depending on the fixture's length, which is determined by the size of the workplace and its proximity to adjacent stations.

Each fixture has an aluminum housing and an acrylic lens and contains from three to six Octon fluorescent tubes. The fixture is built with a series of prisms, facing various directions. They disperse light evenly over the ceiling and then send it cascading over each work area. As a result, they re-

duce most of the glare on display screens.

The fixture is also designed to create the perception that the workspace is brighter than it actually is. This effect, accomplished by leaving part of the light source exposed, was based on a study conducted by Pennsylvania State University and sponsored by Peerless. The study found that if a light source is visible to users, they will perceive the room as being up to 10 percent brighter than it is. (Peerless may soon put a fixture that produces this effect on the market for the general public.)

The fact that the building has no actual windowed offices did not mean that the designers could ignore the effects of daylight on the general lighting scheme to reduce glare on the computer screens. Most of the workstations are unaffected by natural light, but senior management and the secretarial staff are affected. The executives' workstations overlook a three-story atrium filled with natural light, and the secretaries' work spaces are located opposite the building's exterior windows. When the sun shines in too brightly, they get glare on the screens. The solution is simple but effective: vinyl shades dotted with tiny perforations are rolled down over the windows. The shades reduce light entering the building to a comfortable level yet preserve the view.

Illumination for the circulation path has also been carefully designed to prevent screen glare in adjacent workplaces. Mounted along the plasterboard perimeter walls are decorative lighting fixtures, each of which generates low-level light, about 15 to 25 footcandles.

Despite all the efforts of the lighting designers, some employees complain that their workstations are not always bright enough. J. Douglas Davis, market research administration manager, says he would be happier if the conference area in his workplace were brighter. And Vicki Richter, a secretary in the purchases department, notes that although the new lighting is a big improvement, on rainy days some of her colleagues in the office core can't see well. P&G is correcting these problems by giving employees additional task lights, such as architect's arm lamps and glass globe lamps.

Another critical ergonomic concern for corporations is the positioning of the com-

*At P&G, the open-office layout facilitates the project teams' shifts from workplace to workplace. Executive offices overlook the central atrium.*

puter within the workplace. A microcomputer system can occupy as much as 30 percent of the standard desktop. Jon B. Ryburg, a senior associate of Facility Management Institute, research unit of furniture company Herman Miller, Inc., says that companies must locate computers on desks that are large enough to adequately compensate for the space the computer requires or use other surfaces that extend the work area. And the ideal configuration integrates the PC with such items as the telephone, reference materials, files, and windows.

In Procter & Gamble's flexible design, most workstations are equipped with three generously sized work surfaces, each of whose height is adjustable within a 3-inch allowance. Standard items have been modified to P&G needs; each surface hooks onto either 34- or 72-inch-high acoustical panels made of fabric-covered fiberglass and wood.

The surfaces were specifically designed to be deep enough to hold an IBM PC, with the keyboard placed below and in a vertical line with the CPU and the display. Architect Gerner says P&G made no provision for dropped keyboard ledges or separate articulated display surfaces. The system relies on the one-piece flexible work surface and an ergonomically designed chair to make any needed adjustments.

The chair was designed by Niels Diffrient for Knoll International (see PC, Volume 3 Number 19, page 145, for a view of another Diffrient chair). You can adjust its height while seated. You can also alter the seat's depth and the height of the backrest. The backrest also tilts when you apply pressure on it. And the chair, which swivels on a five-prong roll-about base, has short, recessed armrests to allow you to move in close to the work surface.

P&G employees have come up with various approaches for positioning the computer within the space, based on tasks they perform and personal considerations. Michael Ackerman, a systems analyst who spends 30 to 40 percent of his time using the PC, put his computer on a surface that faces the center of his office rather than his doorway. His goal was to minimize distractions from colleagues passing by. On the other hand, analyst David Williams, who spends at least half his workday using

his computer, keeps his system on a surface facing the doorway. This arrangement gives him greater leg room and allows more convenient access to the telephone. Other workers have opted for the same setup so that passersby cannot read confidential on-screen information.

#### Keeping the Noise Down

Noise control is another major consideration in planning workstations for the

### Companies can no longer afford to overlook work space design that facilitates productivity.

multi-PC network. Designers recommend using acoustical paneling around work places and installing acoustical ceilings and sound-absorbing antistatic carpeting. Procter & Gamble's design encompasses all these features and adds a sound-masking system, using speakers in the ceiling to transmit a continuous "white-noise" whoosh. At 9 feet 6 inches, the acoustical ceiling, made of fiberglass covered with reflective material, is higher than average; this creates a feeling of greater spaciousness and helps diffuse light.

To help muffle the irritating clatter large printers make, KPFC designed special closets that envelop printers in acoustical paneling. But Gerner calls the closet "one of the bugs in the system," since the closed door does not allow the emerging printout to be seen. Consequently, many users share printers located on open surfaces at secretarial stations. Several of these printers have been outfitted with sound-dampening hoods. And smaller printers that see daily use from managers are typically kept next to the computers.

#### Cable Management

Perhaps the stickiest dilemma in planning for a large PC network is how to manage computer cables and electrical wires to avoid safety hazards and to prevent "visual clutter." Many furniture companies, such as Steelcase, Inc., and Structural Concepts Corp., are now building systems into work surfaces and paneling that allow cables and wires to run through a "race-

way" or "chase," neatly out of the way. A costlier but tidier approach is to route cables beneath a platform raised above the original floor. Retrofitting a floor in this manner is expensive—approximately \$6 a square foot for labor and materials, not including carpeting.

Procter & Gamble chose the platform or "access floor" approach, using 2-by-2-foot panels to create a 6-inch raised floor. Antistatic carpet tiles 18-inches square are glued to these panels. This arrangement allows facility personnel to dismantle and relocate a workstation in a matter of hours, together with its plug-in cables and wires. Electrical power, signal, and telephone wires are brought up through a channel in the workstation base.

Each workstation has four electrical outlets in a plug-molding attached to the underside of the workstation surface. Throughout the building, modems connect PCs to mainframes, the latter accessed for retrieving and storing data.

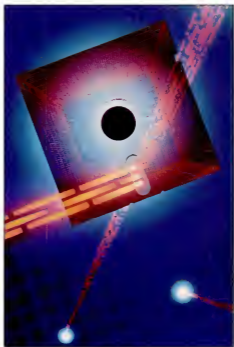
P&G was unwilling to compromise on any aspect of the design. Gerner notes that "the company wanted the best systems furniture available, the best lighting, and the best acoustics. Everything had to work better than anything had ever worked before." The design budget, however, dictated that nothing should cost more than the best-value. But P&G's investment was solid, and KPFC put in 2½ years for research alone on the project.

Every company may not be able to spend that much time or money on work space design, but if predictions calling for every U.S. employee to have a computer terminal within 3 to 5 years are correct, it's not too soon to begin planning an ergonomic work setting. As Ryburg of the Facility Management Institute points out, "Computer use is critical to corporate survival." He might also add that how and where the computer is used is equally critical. Companies can no longer afford to overlook work space design that facilitates productivity—that's now the bottom line. ■

*Jane Wollman is a New York-based freelance writer specializing in electronics. She is the author of Computer Workplace: Ergonomic Design for Computing at Home, published by McGraw-Hill.*

# Microrim's R:BASE 5000 A Database That Delivers

You're not likely to outgrow R:BASE 5000. Easy for novices yet powerful for advanced users, it's one of the most complete database packages on the market.



**W**hat criteria would you select for the perfect database? Here's a wish list: easy enough for a novice to use with little more than a glance at the manual; capable of linking data from multiple files in a straightforward way; an open book as far as favorite spreadsheets and outgrown database packages are concerned; menu driven; equipped with interactive commands, including a complete programming language for procedural files, a procedural file generator to write the files, and also a compiler to hide code and/or speed up applications; and free of any hassle from copy-protection schemes that tie up the floppy disk drive.

Most users would gladly settle for much less, but now no one with \$700 to spend has to. *R:BASE 5000* has arrived, with more standard features than a Japanese sports car.

One of the most complete and powerful database packages on the market today, *R:BASE 5000* is from Microrim, the company that publishes the successful *R:BASE*

*4000* program. When it first hit the market, *4000* presented some attractive features: easy data linking between two files, built-in report and screen format generators, and a prompt that lets you enter correct syntax for almost any command just by filling in the blanks. *4000* was also known for its fast sorts.

The earlier product had its irksome faults, however. You couldn't produce a page break in a report. The only way to link files was to create new, combined tables that took over disk space faster than a flu epidemic. To make matters worse, you could recover the space only by copying your data over to an entirely new set of files. If you were working with floppies and ran out of space before you were through, you often had reason to be thankful for backups. In short, despite its wonderful features, *4000* required you to have more than a cursory understanding of database systems (and of your computer). Also, some of its procedures just could not be automated.

I mention all this in case you met the earlier product, as I did, and left it alone. *R:BASE 5000* is not totally new; it still has those relational database commands like JOIN, UNION, and INTERSECT. But Microrim has added so much more that the package really shines. It's worth a good hard look.

## Between the Covers

Being one of those rare types who actually reads the program manual before booting up, I tend to notice the manual's strengths and shortcomings. However, I must confess that this time I did not give *R:BASE 5000* documentation the usual cover-to-cover treatment.

One reason was its bulk. It started innocuously with two six-page pamphlets: a Quick Start and a Read Me. Next was a binder containing the user's manual—17 chapters and some 470 pages. Then came a spiral-bound reference manual (another 200 pages) and an accordion-fold (11-panel) Command Summary cue card. I felt no

need to wade through all that just to get started.

Another reason why I skimmed on the preparatory reading was that finding what I wanted to know was so easy. The Quick Start pamphlet succeeds in its task of showing you clearly how to get up and running. Since the disks are not copy protected (Microrim states that you may make two copies), the configuration file is the only sticky part. You need to create (or modify) the CONFIG.SYS file on your boot disk, and Microrim solves this by supplying a program that automates this step.

The documentation is thorough, attractive, easy to read for the most part, and accurate. I found only one instance where the manual disagreed violently with what I saw on my screen, and I was forced to experiment a bit to determine which was right. The text is typeset; grey shading delineates screen prints, and clean boxes that look like IBM line graphics set off the command syntax. Drawn illustrations clarify reports, data relationships, and other conceptual material.

The user manual is essentially all tutorial. The first chapters consist of lessons based on files that you create as well as other files on disk. The rest of the manual explains the major functional segments of the program, using plenty of illustrations and exercises based on the same sample files. I was especially impressed with the first part of the tutorial, which walks you through the rather tricky steps of drafting, then redesigning, a database structure before you begin to set up your first file. The illustrations show a pen and a piece of lined paper, which is where a good data-

base application really ought to start.

The user manual is thoroughly indexed, with another nice twist: The index doubles as a glossary, making it easy to look up an

You use EXPRESS, an applications generator, to help define a database structure. It took only minutes to create file structures that would have taken two or three times as long with most other programs.

entry once you know what it means. Tabbed dividers and edge markings showing the different chapters make the manual easy to use.

The reference manual is organized alphabetically, listing each command and diagramming its syntax. These syntax definitions, set off in boxes, are the same as the ones on the Cue Card and on the program's Help screens. Along with explaining the purpose and options for each command, the reference manual gives examples of how the command is used.

#### Taking the EXPRESS

As you work through the tutorial, you'll probably find that you won't need the manual very much. The first exercise gets you to use EXPRESS, an applications generator, to help you define a database structure, and it trains you as you work. Not that what it has you do feels like work: After all, how hard is it to point the cursor to the label for the data field type (text, dollar, integer, real, date, time), then enter the field length? It literally took only minutes to create a pair of file structures that would have taken two or three times as long with most other programs. As you define your files, you are also building a data dictionary for your database system; if you use the same field name again, *R:BASE 5000* automatically recognizes it and enters the field type and length for you.

Even if EXPRESS did nothing more, it would still be worth mentioning. Howev-

er, it goes beyond this. Using the same simple, menu-driven approach, you can build custom menus that automatically let you add, change, delete, and search records, print reports, or even call other menus. As you define the different levels of menus, you can ask EXPRESS to draw a map of them. Figure 1 shows the map for a simple application I created in just a few minutes: The main menu can call either of three others, each of which has about four options. The menu titles are in parentheses, and the titles to the right appear at the top of each menu.

After you finish defining the menus and their actions, EXPRESS turns them into the *R:BASE 5000* program code. Figure 2 shows a sample of the commands that EXPRESS created after I set up the menus shown in Figure 1.

Though EXPRESS scrolls its handiwork on the screen as it writes the program that you requested, you don't need to pay attention to it. I suspect that the only reason the program shows you the code is because it wants to show off how smart it is. You have to admit that it has earned the right to brag a little.

The bottom line is that you could create a custom application involving more than one file without seeing anything but EXPRESS. EXPRESS takes you from file definition to simple report formats to custom menus to custom help screens that you can write yourself. You can even specify that a certain menu be loaded automatically when you first load *R:BASE 5000*. EXPRESS accomplishes these tasks faster than most programmers could, even if they were totally familiar with the *R:BASE 5000* commands.

#### PROMPT Assistance

Of course, some of you want to get into your data and play around with it, making impromptu inquiries, creating fancy data entry forms and validity checks, and designing complex reports. You still don't need to start programming—you can accomplish all this through the interactive mode.

*R>*, the "ready" prompt in *R:BASE 5000*, is similar to the standard DOS prompt except that the letter changes according to what the program is doing at the time. If you're asking for Help screens, the

PC

#### R:BASE 5000

Microrim

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Bellevue, WA 98007

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## R:BASE 5000

prompt changes to H>; D> denotes database definition, P> indicates the Prompt mode, I> signals If-Then processing, and W> represents a While loop. These changes show that *R:BASE 5000* not only makes an effort to let you know where you are in the program, but also gives you some idea of the depth of commands that can be issued interactively.

One of the most interesting is the Prompt mode, which refers to *R:BASE 5000's* capability to prompt you through each step of the complex syntax surround-

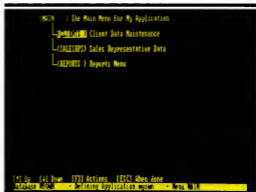
ing most database commands. When you invoke the Prompt mode, a display appears, offering information and blanks that you can fill in to create a command. For example, if you type PROMPT CHANGE COLUMN, you will see the display shown in Figure 3.

Simply fill in the blanks, and *R:BASE 5000* will assemble the correct command on the line below and execute it. Can't remember the column (field) or table (file) names to use in your command? No problem—just ask for a display of all the applica-

priate names, then, when the program responds, copy the name you want into the blank in the prompt box. (You have to type it in yourself; *R:BASE 5000* still leaves a few things for you to do.)

It is still possible to assemble a command with Prompt that won't work, but much more difficult than in the interactive mode. If you do try to execute a command that is not correct, *R:BASE 5000* answers by supplying the proper syntax, as shown in Figure 4.

Sometimes this can be enough to set



### R:BASE 5000: Features and Performance

Number of records per file	Limited by DOS
Number of files open at once	40
Number of screens per file	Limited by storage
Number of fields per record	400
Time to sort 500 records, 2 levels	15 seconds
Field types	Text, dollar, integer, real, date, time
Date math calculations	Yes
Reports	
Change column headings	Yes
Multiple lines/record	Yes
Calculated fields	Yes
Subtotals	Yes
page break	Yes
no. of levels	9
No. of files per report	40



**Figure 1a (top left):** You can use EXPRESS, an applications generator, to build custom menus for a variety of tasks. The menu shown here calls three other menus that have four options each.

**Figure 1b:** As you define menu levels, EXPRESS can map them to show structure. Menu titles are in parentheses; full titles head the menu.

**Figure 2:** Once you define the menus, EXPRESS automatically turns them into R:BASE 5000 program code. This screen shows some of the commands that EXPRESS created from the menus in Figure 1.



you straight. Unfortunately, 5000's response does not show you exactly where in the command your error has occurred: It simply tells you "--ERROR-- Syntax is incorrect for the command", then displays the syntax screen. In one instance where I had simply misspelled a field name, it took me an awfully long time to figure out where I had gone astray.

### The Formative Stages

R:BASE 5000 lets you exercise great control over data entry screens and report formats. On the data entry end, you can format entry screens with your own custom headings. You can also define error-checking rules that will determine if your data falls within acceptable ranges or prohibit duplicates. These refinements are easy to use and can greatly improve the accuracy of the entered data.

The limited reports of R:BASE 4000 are a thing of the past. You can now create reports that print individual records on multiple lines (such as mailing labels) and can force the program to make page breaks at subtotals. Perhaps the most powerful addition is the 40 memory variables available to reports, which can be used for calculations "on the fly" or lookups from other files. This feature makes it possible to link data between files without resorting to the relational commands, which consume a lot of valuable storage space. You can even use the report formatter to create limited

form letters, merging data from files as it formats.

### Import and Export with Style

By now, you may well be thinking, "But I already have all my data loaded into my Acme Whiz-Bang database program, and I'll be plugged into a DIP socket before I'll retype all that again!"

R:BASE 5000 has you covered. In addi-

R:BASE 5000 offers  
File Gateway, a file  
importation utility  
that has more  
intelligence than some  
programmers I have met.

tion to all its other features, it offers File Gateway—a file importation utility that has more intelligence than some programmers I have met. First, it's a linguistic expert that converses with files from Lotus's 1-2-3 (.WKS), PFS:File, Multiplan (.SYL), VisiCalc (.DIF), and dBASE II (.DBF). If your program can't produce one of those, it can still probably create an ASCII text file. Gateway can handle either fixed-length records or delimited files (you specify the delimiter).

Not content to stop there, Gateway makes the conversion process easy. If you

have a table already defined that matches the data you're importing, Gateway will pair the import fields with the definitions even if they are not in the same sequence. And if you haven't gotten around to defining the receiving file yet, that's still no problem: Simply tell Gateway which database (a collection of files) the data should go into, and it will create a file as it goes along. It makes its best guess as to whether a given field should be text, numeric, or whatever, but you can overrule its choices.

Importing is fast. With the Project Database test data, pulling in 500 records took less than 2 minutes. Since R:BASE 5000 can also write out file data in almost as many ways, you can easily send all or part of your data to your favorite spreadsheet or charting program for manipulation.

### More Clangers and Tooters

What else could you want from a database management package? R:BASE 5000 may have it. First of all, Microrim has solved the ridiculous problem that 4000 had with recovering space from deleted records or files. Instead of rebuilding the database to a new database, you can now pack the files and get back your storage space. Packing makes using the relational commands more realistic, since you don't need to use double the storage to recover the space. The process must be a bit involved, however, since 5000 first gives



Figure 3: By displaying a screen that presents instructions and blanks to fill in, the Prompt mode takes you through each step of the complex syntax required to construct a database command.

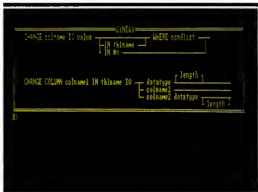


Figure 4: Since R:BASE 5000 assembles the command as you fill in the blanks, it's almost impossible to build a command that doesn't work. If you need help, R:BASE 5000 shows you the proper syntax.

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40	4,400	6,500	4,700	3,300	2,700
41	1,700	3,400	5,500	8,000	8,000
42	9,000	30,000	10,000	10,000	10,000
43	5,050	19,500	11,700	11,700	11,700
44	2,100	6,500	6,600	6,600	6,600
45	2,500	2,500	2,500	2,500	2,500
46	500	2,000	1,000		3,000
47	300	400	500	750	750
48	5,760	5,760	5,760	5,760	5,760
49	230	205	320	335	345
50	7,500	5,000	1,000	1,000	1,000
51	5,000	5,000	5,000	5,000	5,000
52		9,500			
53			2,500		2,500
54	1,500	750	750	1,000	750
55					

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### R:BASE 5000

you a dire warning to back up your data and a chance to abort if you prefer before you pack.

If you do insist on programming your own custom procedures using *R:BASE 5000* and its programming language, you may want to use the text editor built into the program. *RBEDIT* won't even put *WordStar* out of business, but it can be a useful tool for writing procedural files.

If you insist on using  
*R:BASE 5000's*  
programming language,  
you may want to use  
the built-in text editor.

Though *RBEDIT* has no block copy or delete, it does have a full range of cursor controls, and you can access it directly from within *R:BASE 5000*, or you can call it up on its own.

Once you have engineered your software opus, you can speed up its operation and hide your handiwork from prying eyes (or meddling typists) by using the built-in compiler. The compiler doesn't shrink the code, since it fills out commands to occupy 4-byte blocks, but compiled procedures do appear to run faster and certainly cannot be easily deciphered.

### Nearing Perfection

Have I met my dream package? Not yet. A few things about *R:BASE 5000* are still either just wide of the mark or a little bit flawed.

*R:BASE 5000* gives you no way to include free text in a record (as the Memo fields in *dBASE III* do). You also cannot link files without combining them except through a report format. Since you can send reports to the screen as easily as to a printer, this problem is not insurmountable, but it makes defining a report rather involved if all you want is a simple query.

*R:BASE 5000* really needs all 237K of user memory that it asks for. I tried to run it on a Compaq with 256K and a hard disk. After I set the FILES=20 in the CON-FIG.SYS file, I had only 236,864 bytes left available. *RBASE* wouldn't run, and *EXPRESS* behaved strangely by not clearing its screens properly. Though I didn't

try it, the technical support staff said that using FILES=19 frees up enough memory to let R:BASE 5000 run.

I also encountered a small problem on my IBM PC. I had plenty of memory and SideKick loaded (can't do a product review without SideKick!). I could access Gateway directly from DOS without trouble, but when I tried to enter through the R:BASE 5000 main menu, my machine went to Rio. I had to reset to get control back again. According to the technical support person, Microrim is aware of the conflict with SideKick and is currently working on a fix.

I also wish the Prompt mode would show you the command being assembled as you fill in the blanks. That way you could see an incomplete command before executing it and finding out the hard way. On the other hand, unlike dBASE III and many other programs, R:BASE 5000 gives you many options for repeating the last command.

R:BASE 5000 has a limited password system that lets you assign a single read/write password and a single read-only password for each file. While sufficient for small installations and applications, I wish it could set up more stringent and flexible restrictions.

#### Dreaming On . . .

No, R:BASE 5000 isn't my dream database. For now, however, it's close enough, and its utilities give productivity an incredible boost. The program is so

The program is so simple to use that many novice-to-intermediate users could put it to work without outside help.

simple to use that many novice-to-intermediate users could put it to work without requiring outside help, and yet, at the same time, it has such far-reaching capabilities that more ambitious users are unlikely to outgrow it very soon. ■

Alfred Poor is president of Soft Industries, an independent computer consulting firm in Southington, Connecticut.

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# The World According To Zim

Any old database program can shuffle lists and retrieve linked fields, but Zim, using a complex entity-relationship model of data, redefines the way a program looks at information.

If you want to manage a simple address list on your PC, any of the hundreds of database management programs on the market will do the trick. If you want to manipulate more than one file at a time, your choice is more limited, but plenty of products will meet your needs.

But what if you have three or four inter-related databases, and the links between them are many and complicated? What if, in other words, your database situation mirrors the complexity of the real world? Your choice of microcomputer database products now is extremely limited—and you may have to go right to the end of the alphabet before you find the product that you need: *Zim*.

*Zim* is a database management system produced by Zanthé Information Inc. of Ottawa, Canada. *Zim* runs under DOS, UNIX System III and System V, QNX (a UNIX implementation for the PC), and XENIX on the PC AT. The system itself is written in C.

*Zim* is unique, and the source of its extraordinary power to mimic the real world springs from the way it views data. It uses

an "entity-relationship" model of data, an extension of the relational model claimed to be used by most microcomputer database management systems. The entity-relationship model was first introduced back in 1976 by Peter Chen of MIT, and it is popular as a model for teaching about data structure and system design. *Zim* is the first commercial product to implement this entity-relationship method.

The "entity" part of *Zim* essentially parallels what every other database product has: A way to store and manipulate structured information. Like all the other database products, *Zim* can be used with telephone lists, inventory lists, or any other straightforward database. What *Zim* has that no one else has, at least not at nearly the same degree of sophistication, is the ability to express and manipulate the relationships among these entities.

Say you want to build an information system concerning the structure of the United States Congress. Some of the information you would want to store is simply about people and things, the sort of information that any database management system could handle. Two such sets of information you might want to include would

be about senators and about the committees of the Senate. On senators, you might want to store an ID code, each senator's name, state, telephone number, and the name of his chief of staff; on Senate committees, an ID code, the committee's name, its chief of staff, its telephone number, and its chairman.

So far, this is simple stuff. In most programs, each of these information categories would be called a file or database; in the *Zim* world, though, each is called an *entity set*, since *Zim* reserves the word *database* to mean a collection of sets of data and the relationships among them.

A simple relationship among the sets is already evident: each committee has a chairman, who is a senator. In order to use computer storage space efficiently, and in order to make updating the database as easy as possible, you don't want to duplicate any of the information about the chairman in the committees data. The best arrangement would be to simply store the chairman's ID in the Committees record, and if you ever need further information about the senator, you can go across to the Senators file to look it up.

#### Set Linkage

Many database products allow you to create this sort of linkage between files. With *dBASE III*, for example, you could use the command SET RELATIONSHIP TO. You would have to index the Senators file, and you would have to use exactly the same field name for the linked fields in each of the two files. The relationship would evaporate as soon as you wanted to set up another relationship or as soon as you exited *dBASE*. But for as long as the relationship was set up, you could do things like list committees alongside their chairmen's names and chiefs of staff.

Even with simple relationships like this, *Zim* makes life easier. You simply define the relationship thus: SENATORS.ID = COMMITTEES.CHAIRMAN, and you name the relationship; in this case, CHAIREDDBY would be appropriate. The name of the relationship and its definition become a permanent part of your *Zim* database (which, remember, includes a whole collection of data files).

If you then issued the command LIST ALL COMMITTEES CHAIREDDBY

SENATORS, you would get a wide listing showing all the information on each committee, plus, tacked onto the right-hand side, the information from the Senators record for the committees' chairmen. For greater readability, you could use *Zim*'s FORMAT option to list only some fields of the combined record.

*Zim*'s FIND command, as in FIND ALL COMMITTEES CHAIREDDBY SENATORS, lets you assemble a new, temporary set containing those big records, which you can further manipulate—sort, select from, or print out in various formats. Finding a temporary set does not involve making copies of any data; it simply creates an index that lets *Zim* keep track of where the real records are.

Say you wanted to represent more-complicated relationships—for instance, to record which senators are members of which committees. In the entity-set-only world of *dBASE III* and its cousins, you'd have a few choices. You could include a set of fields in each Committees record named Member\_1, Member\_2 and so

on up to the maximum number of members of any committee and then put the committee members' ID codes into those fields. Or you could include all the codes in a long string in a single field. The former storage method would be suitable for producing lists of all the members of the committee but wouldn't be very good for finding out if someone was a member of a particular committee. The latter method makes it easy to see if someone is a member of a committee, but it makes producing a list of committees difficult. In either case, a small program would be required to produce any useful printouts from the connected databases. Both methods waste space if there is any significant variation in the number of members from one committee to another, because both approaches require each Committees record to have enough space set aside to hold the maximum number of senator IDs.

A similar choice would be faced if you wanted to load committee identification information into the senators' records. And if you put the information into both

#### *Zim*: Features and Performance

Number of records per file	Limited by hardware
Number of files open at once	13 in any single statement
Number of screens per file	Limited by storage
Number of fields per record	Limited only by 8,192-byte record size limit
Time to sort 500 records, 2 levels	26 seconds
Field types	Character, variable-length character, numeric character integer, long integer, "vast" integer (8 bytes), date
Date math calculation	Yes
Reports	
Change column headings	Yes
Multiple lines/record	Yes
Calculated fields	Yes
Subtotals	Yes
Page break	Yes
No. of levels	1 per field being reported
No. of files per report	13

*Zim* not only has the power and flexibility to express complex relationships, it also gives you the space to build truly comprehensive databases.

## ZIM DATABASE

sets of records, you would have the hassle of updating both sets of records every time there was a change in committee membership, not to mention the inefficiency of double storage of data.

### A Many-Splendored Thing

The reason this job is so difficult to handle is because the relationship between the two databases is "many-to-many." That is, each senator relates to more than one

committee, and each committee relates to more than one senator. This many-to-many relationship, which is the downfall of most microcomputer database management systems, is the single most important advantage of Zim.

A Zim relationship always consists of a defining equation, like the one above that relates committees to their chairmen. The major extension to this idea—the extension that makes it possible to represent many-to-many relationships—is that a Zim relationship can also contain a table of data, each line of which defines one of the links between the two entity sets.

In the case of the senators and their committees, the table of data is a very simple one: Each row consists of a senator's ID code and the ID code of one of the committees of which he is a member. You can call this relationship Memberof. It has two essential fields, called Senator and Committee.

Remember also that a relationship always has a defining equation. Memberof's defining equation is this:  $\text{SENATORS.ID} = \text{MEMBEROF.SENATOR AND MEMBEROF.COMMITTEE} = \text{COMMITTEES.ID}$ . That is, a record in the senators database is related to a record in the committees database through the Memberof relationship, if the ID field in the Senators record matches the Senator field in the Memberof record, and, at the same time, the ID field of the Committees record matches the Committee field of the Memberof record.

This kind of structure is not that unusual. In dBASE, for example, the best way to handle a structure like this might be much the same: set up a third little dBASE database containing nothing but records defin-

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## ZIM DATABASE

ing the connections. But if you wanted to produce a list of the members of a particular committee, for example, using the Committees, Senators, and Memberof databases, it would be a major bother involving a considerable amount of programming. It certainly isn't information that could be retrieved with a single ad-hoc inquiry.

In *Zim*, the simple command **FIND SENATORS MEMBEROF COMMITTEES** generates a list of each senator-committee combination—that is, a record for each of the lines in the Memberof relationship. **FIND SENATORS MEMBEROF COMMITTEES WHERE COMMITTEES.NAME = 'Raising Taxes'** generates a temporary set of the members of the Raising Taxes Committee.

A relationship can include more than just links to other data sets; it can also carry data about itself. In this example, one feature of the relationship between a senator and a committee is the date the relationship started—the date the senator joined the committee. *Zim* lets you select information based on fields in the relationship just as easily as on fields in the entity sets. **LIST ALL SENATORS MEMBEROF COMMITTEES WHERE MEMBEROF.JOINED > '83/00/00'** would produce a list of senators' committee memberships that began in 1983 or later.

And finally, the triple-whammy, an even more complex kind of relationship. Each senator is a member of a couple of committees. Each committee has a chairman who is a senator. How about a list of the members of all committees chaired by Senator Flam Bouyant?

### Assumed Alias

In *Zim*, in order to eliminate ambiguities in such a roundabout relationship, you can define "roles" or aliases for different sets of data. To accomplish this particular listing, you would have to define an alias for the senators set where it is to be used to find members of committees—perhaps **Members**—and another alias for senators as chairmen—perhaps **Chairmen**.

Take a look at this powerhouse statement that combines all the listing features of *Zim*: **LIST ALL MEMBERS MEMBEROF COMMITTEES CHAIRED BY CHAIRMEN** (remember, both **Members** and **Chairmen** refer to the senators entity set) **WHERE CHAIRMEN.NAME = (Bouyant, Flam) FORMAT MEMBERS.NAME MEMBEROF JOINED COMMITTEES.NAME CHAIRMEN.CHIEF OFSTAFF**. This involved command pulls together information from two sets; one of them under two different names, and presents a table drawn from both the sets as well as from one of the relationships that

joins them. Biff, Pow! Take that, *dBASE III*!

As you can see, *Zim* is an extraordinarily powerful database management system, one that represents and manipulates complex data with dramatic simplicity and economy of expression. But it is not all that simple to use and is designed as an applications development tool for programmers and other sophisticated users rather than as an end-user file manager.

One way in which this sophisticated-user orientation expresses itself is in *Zim*'s use of data dictionary facilities. In keeping with current thinking about the way in which databases ought to be designed, *Zim* considers information about a database (that is, about a collection of entity sets, relationships, documents, and other kinds of *Zim* data) to be data in itself. So just as you can tell *Zim* to **LIST ALL SENATORS** and you see the contents of the entity set **Senators**, you can tell it to **LIST ALL FIELDS** to produce a list of the entity set **Fields**, which contains information on all the fields in all the currently accessible files. Similar entity sets contain information on the current entity sets, relationships, roles, documents (which are ASCII files used for holding user-constructed programs for importing and exporting *Zim* data), forms (input screen definitions), and variables (used in user programs). All this

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## ZIM DATABASE

information is as accessible as any other data, using standard *Zim* commands.

Defining an entity set with *Zim* is not as straightforward as it is in other systems. First, the name of the new set must be added

to the set called Entitysets. Then all the fields in the new set must be added to the Fields set. Finally you command *Zim* to CREATE the entity set; *Zim* then manufactures a DOS file to contain the set. This

three-step process is confusing at first; *Zim*'s producers compare it to first writing and then compiling a program. Similar procedures, all ending with a CREATE command, are required to set up relationships, documents, and roles.

If it is complex to create a set with *Zim*, it is even more difficult to alter an existing set. You must copy the data out into an ASCII document (which can be set up with fields just like an entity set), use the ERASE command to wipe out the set, modify the records in the Fields file that defines the set, recreate the set with the CREATE command, and reload it from the ASCII document. *Zim* provides a couple of simple utilities to make the process a little smoother, and Zanthé promises better alteration features with the next version of the program.

### Data Support

*Zim* supports seven different data types. Numeric data can be stored as ASCII numbers, or as 2-byte, 4-byte, or 8-byte machine-level integers. A numeric field can also be designated to hold date information, which is stored in *yyyymmdd* form. Arithmetic performed on date fields will produce the appropriate results—for example, 19840725 + 20 will yield 19840814. Character data can be stored in fixed-length or in variable-length character strings.

*Zim* entity sets have no preset size limits. Database size is, obviously, limited by disk capacity. Records cannot exceed the size of a "page," the unit in which data is moved back and forth between memory and disk. You can select the page size you want, up to 8,192 bytes, which establishes a practical ceiling on record size. Field length is completely flexible within this record-length limit. Variable-length character fields are estimated to be more efficient than fixed-length ones if the field will be longer than 30 characters. There is a small amount of processing overhead in assembling and disassembling a variable-length field, and 2 bytes per field are required in addition to the data itself.

Data can be added to an entity set or to a relationship by simple commands. ADD allows individual records to be added to a set; CHANGE allows editing of small sets. CHANGE SENATORS WHERE NAME

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= 'Dowell, Nayer' LET TELEPHONE = '376-9876', for example, is a simple telephone number update.

For larger sets, and for database maintenance in a production environment, Zim's form-oriented editing features are more practical. Forms are painted on the screen using a fairly sensible full-screen form editor, and you can perform extensive input editing when using a form. Forms stand alone: You can have as many as you want for any entity set, or you can use the same form for more than one set as long as the field names match. It is not especially easy to use a form: You must write a program that invokes it and then moves the information gathered by the form into a data file. Zim's flexibility is excellent, but you pay a price in ease of use. The system, again, isn't for amateurs.

Data manipulation facilities are Zim's main strength. Zim also includes an extensive library of database functions, any of which can be used anywhere they make sense.

#### A Plethora of Functions

String manipulation functions include concatenation, trimming of left or right blanks, substring extraction, location of a pattern within a string, translation of a pattern to another one, and translation of a string to upper- or lower-case. Mathematical functions include transcendental, hyperbolic, exponential, and a variety of others, including random number generation. Six logical functions allow strings to be tested for various characteristics—for example, \$ISLOWER(string) is true only if string is all lower-case, false otherwise.

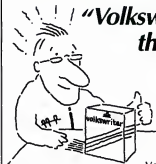
An expression can use and nest many of these functions: For example, a LIST command on the senators set could include WHERE \$TOUPPER(\$SUBSTRING(NAME,3)) = FOG, and the format expression controlling output could include \$CONCAT(\$RTRIM(NAME), ' of ', STATE). Notice here a convenient yet disconcerting feature of Zim: A string like FOG, above, doesn't have to be enclosed in quotation marks unless it contains blanks or is a Zim-reserved word (like LIST).

Zim performs standard functions very quickly. Sorting a 500-record set with records of about 100 bytes each on a 20-byte

character field took 26 seconds. Numeric fields take longer than character fields unless your computer is equipped with an 8087 math coprocessor.

Selecting a subset of 200 records (using

the FIND command) according to a string-comparison criterion took 19 seconds. Selection and manipulation of subsets is done not by moving records around but by manipulating temporary and permanent in-



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## ZIM DATABASE

dexes. When an entity set is CREATED, any number of fields can be defined as indexed fields, and *Zim*, from then on, will use these indexes when it's appropriate without any explicit instructions. Indexes are carried along with the data in a *Zim* file and are permanent parts of the particular entity set. You can't add or delete indexes at will. Each entry in an index takes a few more bytes than the length of the field being indexed. Indexes slow down database updating to a small extent, and extraction speed is slowed considerably.

### The Zim Report

*Zim*'s reporting facilities are very extensive and flexible. The simplest reports are the tables produced by the LIST command. Like most database programs, *Zim* also allows much more complex tabular reports, with totaling, subtotaling, page headers and footers, and other cosmetic features. In an improvement on many other programs, the output from a single record can be flexibly formatted and need not fit on a single line. You could produce a report with the senator's name and the committee name on the first line, the senator's state and phone number beneath his name, the committee chief of staff beneath the committee name, and the committee phone number under that. Many programs allow you to produce such reports using their detailed programming languages; *Zim* gives you a report-gathering command set that does a lot of the work for you.

*Zim*'s programming language includes all the commands and features I've discussed so far as well as conditional branching (IF . . . ELSE . . . ENDIF), looping (WHILE . . . ENDWHILE), input, output, and assignment statements. Rather than using the term *program*, *Zim* calls a set of your commands a *user command*. This terminology is apt: Instead of telling *Zim* to DO or RUN your program, you simply give its name, just as you would give the name of a built-in *Zim* command. If you have named a collection of commands MONTHEND, to execute it you simply type in MONTHEND as you would type in LIST or CREATE.

If you want to pass information to your user command, two different constructs are available to you to accomplish this

task: macro commands and procedures.

Macros make it possible for a *Zim* user command to accept *Zim* commands as input and then execute them. The macros pass strings into a user command and these new strings are then substituted in the program before it is executed.

Procedures are like subroutines in most programming languages. They have parameters that can carry information into and out of a user command. Procedures can call one another and are very flexible. They allow you to build complex applications using structured programming techniques. Unfortunately, the way *Zim* is implemented on DOS systems, each procedure occupies its own DOS file. Complex systems with multiple nested procedure calls will be significantly slowed down as DOS repeatedly opens and closes the files. Zanthé plans to correct this problem.

*Zim* comes with a compiler that condenses and streamlines a *Zim* user command and at the same time encodes it for *Zim* format. It's not a true compiler because it doesn't produce code that is directly executable by the computer. The compiled code must be interpreted by *Zim* or by its run-time version designed to be sold along with applications developed in *Zim*. The compiler costs \$125, and the price of the run-time system depends on how many copies you buy: The first few copies of the run-time program cost 20 percent of the full system's purchase price, dropping to 10 percent as your purchases approach 100 copies.

### The Down Side

*Zim* does have a few flaws. Its documentation is not the best. For someone who has figured out the program's basic ideology (data dictionaries, entities, relationships, and the like) it is a good, clear, fairly comprehensive reference tool. But it is difficult to learn from, and *Zim*, given its differences from most products, requires a fair bit of learning. The program comes with an interactive tutorial that does a good job describing the basic entity-relationship concepts, but it doesn't help at all when it comes time to implement them. About 80 pages of the manual are redundantly used to reproduce screen dumps of the entire tutorial. Zanthé promises that a better man-

ual, designed and produced by documentation specialists and not by Zanthé's programmers, is on the way.

*Zim* does not have a built-in text editor, even of the most rudimentary kind. However, you can set up the program so that you can invoke your favorite text editor without leaving *Zim*. To do this, your system must have enough memory to fit your editor as well as *Zim* itself, and invoking your editor will take just as long from inside *Zim* as it does direct from DOS. Depending on your configuration, that may or may not be a bother. If you are unlikely to be editing massive files, the text editor associated with a desk accessory program like *SideKick* might prove ideal as long as it produces standard ASCII DOS files.

*Zim* uses terminology that causes confusion. *Databases* are gathered into *directories*. A *Zim* directory is actually a DOS file—in fact, the master file of the *Zim* database. It and all the other DOS files that make up the database must be in the same DOS directory, but more than one *Zim* directory can be in one DOS directory.

Changing DOS directories while in *Zim* (*Zim* allows all system commands to be accessed from within the program) can have disastrous results (as can changing floppy disks—I know, because I trashed the directory of a data disk by doing just that). The only way to move from one DOS directory to another or to safely change disks is to quit *Zim* completely. It has no "close everything" or "reinitialize" command. Other than that small inconvenience, the program appears to be very solidly designed and robust, and when you do make an error, the message is usually clear.

### Conclusion

*Zim* is an innovative and powerful product. Its various versions mean that it can be used to develop systems for a wide variety of different computers, including multi-user systems on the AT under XENIX. It can easily solve problems that are either difficult or impossible to deal with using other database programs. *Zim* is one of the few new database products to appear in the recent past that is definitely more than an imitation. ■

John Helliwell is a Toronto-based computer consultant and writer.

# Give Yourself PC Privacy

Here's a short, fast-acting utility that lets you guarantee confidentiality by encrypting any file you select.

One of the problems with having an office full of PCs is that everyone else can get at your files. While most files hardly rate a top security clearance, still, most of us have at least something to hide—or at least to keep confidential. And be they programs or payrolls, everything on a PC is open to inspection.

The short utility presented here lets you privatize any files you wish. Called "Lock," the program encrypts your files, making them unreadable by anyone who cannot supply the correct password or phrase. It does this by mixing bits drawn from different parts of the file, scrambling the whole so that the result becomes complete gibberish to the intruder. While not aimed at replacing military or National Bureau of Standards encryption schemes, Lock is an easy way to get more than adequate, medium-strength security.

While LOCK.COM (and the matching UNLOCK.COM) are regular DOS commands, the easiest way to create them is not with an assembler, but by making a one-time-only excursion into BASIC. If you type in the BASIC listing shown in Figure 1 and run it, you will automatically generate the two DOS commands, LOCK.COM and UNLOCK.COM. Alternatively, if you have a modem, you can call PC's Interactive Reader Service, (212) 696-0360, and download them directly. To get a copy of the assembly language source listing, you can either download it from PC-IRS via modem or send a self-addressed, stamped envelope to Lock, Technical Editor, PC Magazine, One Park Ave., New York, NY 10016.

LOCK.COM accommodates path-

## 1985/No. 18



names and can even read from and write to different disks. Just type, for example,

```
LOCK B:\ARCHIVES\PAYROLL.$$$ A:MIXED.UP
```

Lock will read in the file PAYROLL.\$\$\$ from B:\ARCHIVES and then ask you for a phrase to use in locking it up. While some programs allow only a modest six- or eight-character password, Lock allows you to enter up to a full 64-character "passphrase" when you are prompted. Lock then scrambles the file and puts the new version into the file A:MIXED.UP. If you don't specify a filename for the scrambled version, LOCK will create a file named FILE.LOC in the current subdirectory. To unlock the file you type

```
UNLOCK A:MIXED.UP B:PAYROLL.$$$
```

and supply the (same!) passphrase you used to lock the original file. Lock's only

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## PROGRAMMING

limitations are that the file it is intended to protect must be less than 62K in length and you must use DOS Version 2.0 or higher.

Lock is not copy protection as you've probably experienced it. The usual (and increasingly vulnerable) method of copy

protection consists of putting part of your program into areas on the disk that are not formatted as DOS expects them to be. To skim them from the disk, your program must be expert enough to change the disk parameter table and to know just which

sectors to skim, which means that you had to put them into specific sectors to begin with. All of this big-city sophistication to prevent you from making backups of your disks is beyond my simple program. Come to think of it, though, with the profusion of

```

10 PRINT "Checking Data..."
20 CHECK#=0
30 FOR N = 1 TO 340:READ BYTE.%.CHECK#=CHECK#+BYTE.%.NEXT N
40 IF CHECK# = 29409 THEN 60
50 PRINT "Error in Data Statements":GOTO 220
60 RESTORE:CLS:N$="LOCK.COM"
70 OPEN N$ AS #1 LEN = 1 'Open File
80 PRINT "Creating "N$
90 FIELD #1,1 AS BYTE.% 'Specify what goes into it
100 FOR N = 1 TO 340 '340 bytes
110 READ BYTE.%
120 IF BYTE.% <> -1 GOTO 140
130 IF N$ = "LOCK.COM" THEN BYTE.% = 13 ELSE BYTE.% = 5
140 IF BYTE.% <> -2 GOTO 160
150 IF N$ = "LOCK.COM" THEN BYTE.% = 202 ELSE BYTE.% = 194
160 LSET BYTE.$ = CHR$(BYTE.%) 'Load byte into buffer
170 PUT #1 'Write buffer out
180 NEXT N
190 CLOSE #1 'Close file
200 PRINT N$ " Created." 'And you're done.
210 IF N$ = "LOCK.COM" THEN N$="UNLOCK.COM":RESTORE:GOTO 70
220 END
230 DATA 235, 52, 144, 80, 104, 114, 97, 115, 101, 58
240 DATA 32, 36, 70, 73, 76, 69, 46, 76, 79, 67
250 DATA 0, 13, 10, 70, 105, 108, 101, 32, 78, 111
260 DATA 116, 32, 70, 111, 117, 110, 100, 36, 13, 10
270 DATA 68, 105, 115, 107, 32, 70, 117, 108, 108, 36
280 DATA 0, 0, 0, 0, 187, 129, 0, 67, 128, 63
290 DATA 32, 117, 13, 198, 7, 0, 46, 137, 30, 50
300 DATA 1, 46, 255, 6, 50, 1, 128, 63, 13, 117
310 DATA 232, 198, 7, 0, 46, 131, 62, 50, 1, 0
320 DATA 117, 7, 46, 199, 6, 50, 1, 12, 1, 46
330 DATA 141, 22, 3, 1, 180, 9, 205, 33, 187, 190
340 DATA 0, 198, 7, 64, 83, 90, 180, 10, 205, 33
350 DATA 187, 192, 0, 83, 128, 63, 13, 116, 9, 128
360 DATA 15, 1, 128, 39, 15, 67, 235, 242, 91, 184
370 DATA 0, 61, 186, 130, 0, 205, 33, 115, 12, 46
380 DATA 141, 22, 21, 1, 180, 9, 205, 33, 233, 177
390 DATA 0, 83, 139, 216, 185, 0, 248, 141, 22, 84
400 DATA 2, 180, 63, 205, 33, 5, 84, 2, 46, 163
410 DATA 52, 1, 46, 255, 14, 52, 1, 180, 62, 205
420 DATA 33, 91, 141, 14, 84, 2, 139, 241, 46, 59

```

(Figure 1 continues)

Figure 1: This BASIC program will create both LOCK.COM and UNLOCK.COM when it's run.

## PROGRAMMING

430	DATA	54,	52,	1,	115,	80,	139,	249,	51,	192,	138
440	DATA	7,	3,	248,	139,	207,	65,	67,	128,	63,	13
450	DATA	117,	3,	187,	192,	0,	46,	59,	62,	52,	1
460	DATA	118,	22,	46,	139,	62,	52,	1,	87,	43,	254
470	DATA	247,	199,	1,	0,	95,	117,	7,	208,	-1,	79
480	DATA	59,	247,	115,	31,	138,	52,	138,	21,	81,	138
490	DATA	15,	67,	128,	63,	13,	117,	3,	187,	192,	0
500	DATA	211,	-2,	89,	136,	52,	136,	21,	70,	59,	247
510	DATA	116,	170,	79,	235,	225,	180,	60,	185,	0,	0
520	DATA	46,	139,	22,	50,	1,	205,	33,	114,	24,	139
530	DATA	216,	180,	64,	141,	22,	84,	2,	46,	139,	14
540	DATA	52,	1,	129,	233,	84,	2,	65,	205,	33,	59
550	DATA	193,	116,	11,	141,	22,	38,	1,	180,	9,	205
560	DATA	33,	235,	5,	144,	180,	62,	205,	33,	205,	32

(Figure 1 ends)

today's copying programs, my modest Lock is probably more effective at protecting your files, anyway.

When you encrypt a file, you obviously don't want to lose any of the original infor-

mation in it. Neither do you want to add anything to it that would consume valuable disk space. The simplest way to achieve these goals is to have Lock simply take the original bits that make up the file and rear-

range them. Unlock will later untangle and restore the file. While the PC has relatively few ways of actually working with the individual bits of a 16-bit word (unlike the 8088's forerunner, the 8080), it does have

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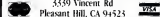
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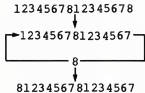
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## PROGRAMMING

a few. One of these is to rotate the bits thus:



In our example, a byte is rotated to the right one place, moving the last bit to the first place. Lock uses this method. Taking two 8-bit bytes from different parts of the file, it first forms one 16-bit word. It is then very simple to "rotate" this word, thus mixing the bits from the two bytes. After they've been well rotated, the two bytes are separated again and put back into the file in their original places. Lock then proceeds to work on two other bytes. In the absence of a more suitable name, I'll dub this medium-security method the Holzner algorithm.

In order to operate, of course, the Holzner algorithm must know from where in the file to take the bytes and how many times to rotate the temporary 16-bit word they form before it puts them back. This information is derived from the passphrase you supply.

Each character in your passphrase has an ASCII code, of course. Starting at the beginning of the file, therefore, Lock uses the first ASCII value (say 65) in the passphrase to tell it to mix the file's first byte with byte number 65. The second byte will be rotated with byte 64, the third with byte 63, and so on. To decide how many times to rotate each pair of bytes Lock uses the ASCII code of the next character in the passphrase. After all these bytes have been mixed Lock moves on to the next group, using the next two ASCII values in the passphrase. When it has used each character in the passphrase, it will start over again from the beginning. (Incidentally, the program internally will always make the number of characters in your passphrase odd and takes care that no byte "in the middle" is left intact.)

In this way, anyone trying to break the code must discover not only the number of times each pair of bytes was rotated, but also where in the file they came from. The

scrambled file will simply appear to him as an incoherent stream of bits (as it will to you, too, if you forget your passphrase).

The difference between LOCK.COM and UNLOCK.COM is very small. LOCK.COM forms combinations of bytes and rotates them to the right; UNLOCK.COM does exactly the same, but rotates to the left. By just replacing the right-rotate commands with left rotating ones, LOCK.BAS can create both LOCK.COM and UNLOCK.COM for you in one easy session. Only two instructions in the assembler code need to be changed between using it to make LOCK.COM and UNLOCK.COM, and these are plainly marked, should you take this route.

## The Odds

No discussion of security would be complete without a discussion of the odds of cracking the combination. For a passphrase of length  $n$ , the formula giving the number of possible ways of scrambling the file is  $8$  raised to the  $n$ th power. If you use a passphrase of even ten characters, that's an impressive 1,073,741,820 ways of scrambling the file—and that's assuming the would-be codebreaker knows how the Holzner algorithm works in the first place. The chances of guessing the correct phrase in one guess and the chances of the sun exploding in the next five minutes are probably equal, so if you're safe trusting the one, you're safe with the other.

If no one but you knows the length of the passphrase, it makes cracking the code that much harder. And if this isn't enough for you, you can simply apply a double lock by using Lock again on the once-scrambled file, thus, squaring the number of possible ways the file could have been scrambled. To unlock a doubly locked disk, just apply the passphrases in reverse order.

## A Final Caution

Nothing is more embarrassing than securely locking a trunk and then losing the key. So, in addition to remembering your passphrase, make sure that you have a copy of Unlock around before you put on the Lock itself.

Steve Holzner is a contributing editor of PC Magazine.

# Spreadsheet Clinic

Labor-saving macros are the focus of this installment. PC Magazine readers share their discoveries for projecting dates, manipulating cells, and updating databases.

## Updating a Database

Lotus's 1-2-3 lets you extract data easily by using the /Data Query command, but it doesn't have a command that lets you update a database. I have written a macro (see cells B47 to B61 in Figure 1) that does so.

At the top of Figure 1 there is a tiny, sample database with three fields: reference number, description, and total. Below it is the data query output area and below that, in cells B39..B40, the criterion range.

When you call the macro, it first sends the cursor to an "anchor" cell (B21), which is located so as to display the database and the query-output area. Enter the name of a customer ("description" field in the database), and the record that meets that criterion appears in the output area. The macro then prompts you for the amount by which you want to adjust the "total" for that record. Enter the amount, and the macro adds it to the value that was originally in that field and then writes the updated record back to the database. The macro then loops back to the beginning and lets you choose between updating another macro or quitting.

The macro is limited in that the database area must not be moved. Its beginning row and column is written into the macro in line 56, so the macro would have to be changed if the database were moved. The relative position of records within the macro is never a problem, though, so long as the reference numbers in cells B25..B27 are formulas of the form

Previous Cell + 1

That way, you can sort the database as much as you like and F9 (Recalc) will put all the reference numbers back in sequence. It's important that they stay in sequence because the macro uses the reference number (lines 56 through 59) as the cell address for writing the update record back to the database.

John Nawrocki  
Collierville, Tennessee

*This is a handy general-purpose macro for entering new data into a database, and you can jazz it up as much as you like. For example, if you have several criteria by which you want to query the database, you could have it ask for matching information*

*from more than one field. Again, instead of the addition that takes place in line 52, you could choose any operation to perform on the record.*

*One note of caution: As it is currently written, this macro will misbehave if you enter a name to update and 1-2-3 doesn't find a match. It will return a blank line to the query output area. If you proceed with an adjustment amount, it will copy that amount, unchanged, to the cell named "outtotal" and will then copy the dummy record to line 24, thus wiping out the first line of your database. A way around that would be to put a line in the macro after line 49 that tested the value in cell B33 and that looped back to the beginning if the value were zero.*

## Tracking the Years and Months

My company recently had trouble using 1-2-3 to calculate the number of years and months from one date to another. The formula we originally used was (+E5-E4)/365, which gave the results in a decimal format, as shown in cell E8 of Figure 2. Decimal years are awkward, so I de-

	A	B	C	D
21				
22				
23				
24	DEMO DATABASE	REFNO	DESCRIPTION	TOTAL
25	REFNO = PREVIOUS CELL + 1	1	DOE	334
26	DESCRIPTION = CUSTOMER	2	BROWN	350
27	TOTAL = FIELD TO BE UPDATED	3	JONES	412
28				
29				

(Figure 1 continues)

Figure 1: A macro for updating records in a database.

## SPREADSHEET CLINIC

(Figure 1 continued)

	A	B	C	D
31			QUERY OUTPUT AREA	
32				
33	QUERY OUTPUT AREA	REFNO	DESCRIPTION	TOTAL
34	RANGE "UPDATEREC"----->	3	JONES	412
35	"OUTREFNO"-----^			
36	"OUTDESCRIPT"-----^			
37	"OUTTOTAL"-----^			
38				
39	SELECTION CRITERION AREA	DESCRIPTION		
40	RANGE "CRITNAME"----->	JONES		
41				
42	"TRANSACTION"----->	412		
43				
44				
45	DATABASE UPDATE MACRO			
46				
47	DISPLAY THE DATABASE	{GOTO}ANCHOR"		
48	GET CUSTOMER NAME	/XLENTER NAME TO UPDATE OR 'ESC' TO QUIT: "CRITNAME"		
49	SHORT CUT QUERY (F7)	{QUERY}		
50	GET ADJUSTMENT AMOUNT	/XENTER AMOUNT TO ADJUST TOTAL: "TRANSACTION"		
51	GOTO "TRANSACTION" (B42)	{GOTO}TRANSACTION"		
52	ADD ADJ. AMOUNT TO PREV. TOTAL	{EDIT}+OUTTOTAL{CALC}"		
53	COPY BACK TO OUTPUT TOTAL FIELD	/COUTREFNO"OUTTOTAL"		
54	PUT REF. NO. INTO MACRO (B58)	/COUTREFNO"SAVEINST"		
55	GOTO REF. NO. IN MACRO	{GOTO}SAVEINST"		
56	ADD BEGINNING ROW & COLUMN (B25)	{EDIT}+24{CALC}{HOME}B"		
57	COPY UPDATED RECORD TO DATABASE	/CUPDATEREC		
58	CELL NAMED "SAVEINST"----->	B27		
59	FINISH COPY COMMAND			
60	DISPLAY THE DATABASE	{GOTO}ANCHOR"		
61	REPEAT MACRO	/XGVA"		

(Figure 1 ends)

vised two formulas to give proper results in years and months.

The first is the formula in cell E12, which determines the number of whole years between two dates, in this case, November 28, 1985 and June 4, 2033. The formula subtracts the earlier year from the later year but uses an @IF statement to decide whether the final year in the later date should be treated as a whole year. If the

month in the later date is less than a full year after the month in the earlier date, the formula doesn't count the last calendar year; it subtracts one from the difference between the two years.

Thus, in the example shown in Figure 3, the difference between the year 2033 and the year 1985 is 48, but since June is not a full year after November, the formula gives 47 as the number of years. The sec-

ond formula, in cell F12, "picks up the slack" by counting the number of months past the last full year. In the case in Figure 3, the @IF function first determines that June is not a full year after November. Therefore, it subtracts June (6) from November (11), and then subtracts the remainder (5) from 12 to give the proper difference in months (7). If the month in the later date had been more than a full year after the month in the earlier date, it would have subtracted the earlier month from the later month. When the results of these two formulas have been calculated, they are displayed in cells E12 and F12.

Jan Koenig  
Cincinnati, Ohio

*This is a very nice pair of formulas, but why not do for the leftover days what you did for the leftover months? After all, your formulas do a strange sort of rounding that ignores the days entirely. I have therefore written two more formulas (cells G15 and G16) that take days into consideration. The first subtracts 1 from the number of*

	C	D	E	F	G
4		Start	28-Nov-85		
5		Finish	04-Jun-2033		
6					
7					
8	1.	Decimal	47.55		
9					
10					
11	2.	Yr/Mo	Years	Months	
12			47	7	
13					
14	3.	Yr/Mo/Day	Years	Months	Days
15			47	6	6
16					

Figure 2: Different ways to calculate time between two dates. See Figure 3.

## CELLS

## FORMULAS

E8	(+E5-E4)/365
E12 & E15	@YEAR(E5)-@YEAR(E4)-@IF(@MONTH(E5)<@MONTH(E4),1,0)
F12	@IF(@MONTH(E5)<@MONTH(E4),12-(@MONTH(E4)-@MONTH(E5)),@MONTH(E5)-@MONTH(E4))
F15	@IF(@DAY(E5)<@DAY(E4),F12-1,F12)
G15	@IF(@DAY(E5)<@DAY(E4),30-(@DAY(E4)-@DAY(E5)),@DAY(E5)-@DAY(E4))

Figure 3: The formulas used for the date calculations in Figure 2.

months as calculated in cell F12, if the day of the later month is less than the day of the earlier month. The second then "takes up the slack" exactly the same way your second formula does. It will not always give the exact number of days, for it assumes that all months have 30 days. Nevertheless, an answer of 47 years, 6 months, and 6 days (which should really be 7 days) is better for some purposes than simply 47 years and 7 months.

### Cell Mating

I have written a macro that combines the contents of two different 1-2-3 worksheet cells and writes them to a third cell. In the example in Figure 4, the macro (lines 3 to 33) combines the book titles in cells C37..C39 with the authors in cells D37..D39, puts the word "by" between the two, and writes the results to cells E37..E39.

The macro works on the principle of

filling in "holes" in the macro (cells D11 and D13) with variables, and operating on those variables when the macro processor gets to those cells. The macro uses several predefined range names, but in every case the range is the cell to the right of the range name in cells C3..C33. The macro can, of course, be used to combine strings of any kind.

Steven Goldstein  
Annandale, Virginia

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## SPREADSHEET CLINIC

This macro performs exactly as Mr. Goldstein advertises. However, I found a way both to simplify it and to eliminate the awkward series of {del}'s (lines 14 and 15) in the process. All you have to do to accomplish this is to remove lines 9, 14, 15, 32, and 33, and to replace line 20 with /re-EDIT'. Then give a blank cell the range name EDIT, so as to put that part of the "work area" outside the macro. The routine

Here's a macro that combines the contents of two worksheet cells and writes them to a third.

will then run a little more quickly and will take up fewer lines.

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	C	D	E	F
3	\C	{goto}c37~		Cursor to first title field
4	CONTINUE	/rncTITLE~		Name the field TITLE
5		/c~TITLE_X~		Copy title to work area
6		{right}		Cursor to author field
7		/c~AUTHOR_X~		Copy author to work area
8		{goto}EDIT~		Cursor to work area
9	EDIT	{edit}{home}		Edit work area
10				Label prefix
11	TITLE_X			Read title
12		by		Insert " by "
13	AUTHOR_X			Read author
14		{del}{del}{del}{del}{del}{del}		Delete "{edit}{home} from
15		{del}{del}{del}{del}{del}{del}		the work area
16				End edit
17		{goto}TITLE~		Cursor to TITLE
18		{right}{right}		Cursor to Title/Author field
19		/cEDIT~		Copy work area to Title/Author
20		/cEDIT_COM~EDIT~		Replace edit command
21		{goto}TITLE~		Cursor to title field
22		/rncEND_CHECK~{down}~		Create range to check for end
23		/xi(@count(END_CHECK)=1)~/xgEND~		If next title field empty, END
24		/rndEND_CHECK~		Delete range for end check
25		/rndTITLE~		Delete old TITLE
26		{down}		Cursor to next title field
27		/xgCONTINUE~		Loop back to beginning
28				
29	END	/rndEND_CHECK~		Delete range for for end check
30		/rndTITLE~		Delete old TITLE
31		/xq		Quit
32				
33	EDIT_COM	{edit}{home}		Edit command replacement
34				
35				
36	TITLE	AUTHOR	TITLE/AUTHOR	
37	Rob Roy	Walter Scott	Rob Roy by Walter Scott	
38	Burmese Days	George Orwell	Burmese Days by George Orwell	
39	Main Street	Sinclair Lewis	Main Street by Sinclair Lewis	
40	Here at PC	Ruth Saperstein	Here at PC by Ruth Saperstein	
41	Digging Egypt	Rosetta Stone	Digging Egypt by Rosetta Stone	
42	Moby Dick	H. Melville	Moby Dick by H. Melville	

Figure 4: A macro that combines strings from two cells and puts the result in a third cell.

# Power User

In this forum, readers share the hardware and applications software discoveries they use to increase productivity. This installment focuses on dBASE.

## A dBASE-DOS Interface

One of dBASE II's most lamented missing features is the ability to temporarily suspend dBASE, execute another program, and then return to dBASE at the point you left it. You can use dBASE's QUIT command to return to DOS, execute the desired program, and then restart dBASE, but this takes time and the values of memory variables are lost.

There is, however, a trap door that can be used to provide dBASE with this feature. The undocumented POKE and CALL statements allow you to poke an assembler subroutine into memory and then

call it up using a memory variable as an argument. The EXECDEMO.PRG routine, listed in Figure 1, lets your dBASE II program execute anything you can execute from the DOS prompt, including .COM, .EXE, and .BAT files, or DOS internal functions such as COPY and DIR.

This program first establishes a memory variable named SUBLOC and assigns a value of 60,160 to it, used as the starting point for poking the subroutine into memory. Memory in this range is used only by the SORT command. Poking the subroutine into this area means that it will not interfere with dBASE's normal operation,

```
* EXECDEMO.PRG - load & execute a program from dBASE
* By Brett Ralier, Atlanta, GA
* Set poke address (must be at least 60,160)
*
SET TALK OFF
STORE 60160 TO SUBLOC
*
* Poke subroutines into memory, starting at SUBLOC
*
POKE SUBLOC+0, 0, 235, 20, 0, 0, 128, 0, 0, 0, 92, 0
POKE SUBLOC+10, 0, 0, 108, 0, 0, 0, 0, 0, 0, 0, 0
POKE SUBLOC+20, 0, 0, 232, 0, 0, 94, 131, 238, 23, 137
POKE SUBLOC+30, 109, 18, 180, 0, 224, 83, 187, 0, 16, 180
POKE SUBLOC+40, 74, 205, 33, 115, 6, 180, 1, 91, 233, 140
POKE SUBLOC+50, 0, 91, 191, 44, 0, 139, 21, 137, 20, 140
POKE SUBLOC+60, 218, 137, 84, 4, 137, 84, 8, 137, 84, 12
POKE SUBLOC+70, 137, 108, 14, 86, 139, 243, 130, 15, 181, 0
POKE SUBLOC+80, 70, 81, 138, 4, 60, 32, 116, 7, 60, 47
POKE SUBLOC+90, 116, 3, 70, 226, 243, 89, 86, 43, 243, 78
POKE SUBLOC+100, 43, 206, 191, 128, 0, 136, 13, 71, 94, 81
POKE SUBLOC+110, 86, 252, 243, 164, 176, 13, 170, 94, 176, 0
POKE SUBLOC+120, 136, 4, 191, 92, 0, 185, 36, 0, 243, 170
POKE SUBLOC+130, 89, 227, 16, 190, 129, 0, 191, 92, 0, 184
POKE SUBLOC+140, 1, 41, 205, 33, 191, 108, 0, 205, 33, 94
POKE SUBLOC+150, 184, 0, 78, 139, 211, 66, 139, 223, 205, 33
POKE SUBLOC+160, 115, 0, 180, 2, 235, 4, 144, 184, 0, 0
POKE SUBLOC+170, 140, 203, 142, 219, 142, 195, 232, 0, 0, 94
POKE SUBLOC+180, 129, 238, 177, 0, 250, 142, 211, 139, 100, 14
POKE SUBLOC+190, 251, 137, 68, 16, 139, 100, 18, 195
*
* Establish the argument
*
STORE V TO CONTINUE
DO WHILE CONTINUE
ERASE
STORE '
* TO PROGRAM
* 1,1 SAY 'EXECDEMO'
* 2,1 SAY 'This program demonstrates use of the DOS 3.00 EXEC function. It can'
```

(Figure 1 continues)

Figure 1: A dBASE II routine that lets you execute programs from DOS.

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but the subroutine will be overwritten if a sort is performed. If your program uses the SORT function, be sure to POKE the subroutine into memory again before attempting to call it.

To run the EXECDEMO.PRG routine, you need the following: *dBASE II* Version 2.4 or later, DOS 2.0 or later, at least 128K of memory, and COMMAND.COM in the current directory.

Also note that the program won't work at all with *dBASE III*, since it does not support the **POKE** and **CALL** statements.

Brett Salter  
Atlanta, Georgia

**POKES and CALLS** are an excellent—if slippery—way to get around a number of problems found in dBASE II. Once you've mastered the technique used in Figure 1, you can use the heart of EXECDEMO.PRG to run specific DOS applications directly from within dBASE. Figure 2 shows how this technique can be adapted to call up WordStar (the editor I use most often when writing my own program files) from within dBASE II. To call up your own favorite editor—or anything else from DOS—just substitute the appropriate drive, path, and name of your application in place of "WS" in line 2 of the program.

### Screen Utilities for dBASE III

When developing applications using *dBASE III*, it is often desirable to center or right-justify output to the screen or printer. The two short .PRG files shown in Figure 3 allow for this type of justification without having to count characters or spaces.

Line by line, the program works as follows: Line 1 establishes the parameters that need to be passed when the program is called. Line 2 establishes the width of the output device. The value shown, 80, is generally used for screen output. This can be changed to 133 if output is to a wide-carriage printer.

Lines 3 and 4 are used to preserve the cursor's position at the time the program is called. Line 5 computes the starting column of the text in `STRING` and sends it to the output device. Finally, line 6 resets the cursor to its position at the time of the program call.

Dan Domzalski  
Buffalo Grove, Illinois

```

3,1 SAY 'Be used to execute any program that can be executed from the DOS'
4,1 SAY 'prompt, while keeping the current copy of DBASE II in memory. This'
5,1 SAY 'program requires DOS 2.00 or later, and at least 128K RAM. The'
6,1 SAY 'COMMAND parameter must indicate where COMMAND.COM can be found.'
8,1 SAY 'To execute a COM or EXE program, enter the full filename, including'
9,1 SAY 'the extension. To execute a DOS Internet function, such as DIR,'
10,1 SAY 'enter "COMMAND.COM/C function". See the following examples.'
12,1 SAY 'Use "C:\BASIC.COM" to run BASIC from the root directory of drive C'
13,1 SAY 'Use "C:\COMMAND.COM/C DIR A:" to display the directory of drive A'
14,1 SAY 'Use "C:\COMMAND.COM/C AUTOEXEC.BAT" to run AUTOEXEC.BAT'
15,1 SAY 'Use "C:\COMMAND.COM" to load a new copy of the command processor.'
17,1 SAY 'Program to run?' GET PROGRAM

READ
STORE TRIM(PROGRAM)+ ' ' TO PROGRAM
*
* Set call address to SUBLOC
*
SET CALL TO SUBLOC
*
* Call the subroutine with one argument
*
CALL PROGRAM
*
* Check for error
*
STORE PEEK(SUBLOC+19) TO ERRTYPE
IF ERRTYPE=1
? 'Unable to release memory above DBASE II'
ENDIF
IF ERRTYPE=2
? 'Unable to execute program'
? 'Error reason (see page D-14 of DOS 2.00 manual): ',PEEK(SUBLOC+18)
ENDIF
*
* Check for another
*
INPUT 'Continue (y/n)?' TO CONTINUE
ENDDO
*
* Return to caller
*
RETURN

```

(Figure 1 contd)

```

CALLWS.PRG - loads & executes WordStar from within dBASE
SET TALK OFF
STORE "C:\COMMAND.COM\C MS" TO PROGRAM
STORE 60160 TO SUBLOC
POKE SUBLOC+ 0, 235, 20, 0, 0, 128, 0, 0, 0, 92,
POKE SUBLOC+ 10, 0, 0, 108, 0, 0, 0, 0, 0, 0,
POKE SUBLOC+ 20, 0, 0, 232, 0, 0, 94, 131, 238, 23,
POKE SUBLOC+ 30, 100, 18, 188, 0, 224, 83, 187, 0,
POKE SUBLOC+ 40, 74, 208, 33, 115, 6, 180, 1, 91,
POKE SUBLOC+ 50, 0, 91, 191, 44, 0, 139, 21, 137,
POKE SUBLOC+ 60, 218, 137, 84, 4, 137, 84, 8, 137,
POKE SUBLOC+ 70, 137, 100, 14, 86, 139, 243, 138,
POKE SUBLOC+ 80, 70, 81, 138, 4, 60, 32, 116, 7,
POKE SUBLOC+ 90, 116, 3, 70, 226, 243, 89, 86,
POKE SUBLOC+ 100, 43, 206, 191, 128, 0, 136, 13,
POKE SUBLOC+ 110, 86, 252, 243, 164, 176, 13,
POKE SUBLOC+ 120, 136, 4, 191, 92, 0, 185, 36,
POKE SUBLOC+ 130, 89, 227, 16, 190, 129, 0, 191,
POKE SUBLOC+ 140, 41, 41, 205, 33, 191, 108, 0,
POKE SUBLOC+ 150, 184, 0, 75, 139, 211, 6,
POKE SUBLOC+ 160, 115, 5, 180, 2, 235, 4,
POKE SUBLOC+ 170, 140, 203, 142, 219, 142,
POKE SUBLOC+ 180, 129, 238, 177, 0, 250,
POKE SUBLOC+ 190, 251, 137, 68, 16, 139,
ERASE
SET CALL TO SUBLOC
CALL PROGRAM
ERASE
RETURN

```

**Figure 2:** A variation on Figure 1 that loads WordStar from dBASE II.

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```

*CENTER.PRQ D.M. Domzalaki-- Centere text messagee on screen.
PARAMETERS ROW, STRING
WIDTH=80
R=ROW()
C=COL()
@ ROW,0+(WIDTH-(LEN(STRING)))/2 SAY STRING
@ R,C SAY ' '

*RIGHT.PRQ D.M. Domzalaki-- Right-justifiee messagee on screen.
PARAMETERS ROW,STRING
WIDTH=80
R=ROW()
C=COL()
@ ROW,0+(WIDTH-(LEN(STRING))) SAY STRING
@ R,C SAY ' '

```

Figure 3: A couple of routines that will center or right-justify text in dBASE III.

These two short routines can be useful for displaying program titles, help messages, and other text on screen or in your custom reports. If you prefer, you can eliminate lines 3, 4, and 6, which will cause the screen cursor to reappear on the line be-

low your message text.

Figure 4 shows how dBASE II users can achieve the same effect. While the routine lacks dBASE III's elegance (because there isn't a PARAMETERS command in II), the crucial line performing the neces-

sary row+column calculations works exactly the same in both versions of dBASE, and runs just as quickly.

I've used macros in Figure 4 solely to demonstrate how the program works. You can achieve the same results using your row/column parameters directly. This permits you to write only one line into your command file for each screen message. Using macros, however, does allow you to copy the routines into any of your files. You change the results by changing the numbers and text string stored at the top of the routines.

#### Converting dBASE's Date Fields

Ashton-Tate's creation of a new data type, the Date field, may cause a lot of confusion to new dBASE III users. This new data type has several unique features that demand extra knowledge and effort to be useful. Here are a few shortcuts that are not explained in the manual but do work.

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```
*CENTERII.PRQ (D.O.)-- Centers text strings on your screen.
STORE "YOUR CENTERED TEXT" TO STRING
STORE 5 TO ROW
STORE 80 TO WIDTH
@ ROW,0+(WIDTH-(LEN(STRING)))/2 SAY STRING
RETURN

*RIGHTII.PRQ (D.O.)-- Right-justifies text on your screen.
STORE "YOUR FLUSH-RIGHT TEXT" TO STRING
STORE 5 TO ROW
STORE 80 TO WIDTH
@ ROW,0+(WIDTH-(LEN(STRING))) SAY STRING
RETURN
```

Figure 4: A couple of routines that will center or right-justify text in dBASE II.

1. When converting Character data types to Date types, normally it is necessary to use the special CTOD function. However, if a file already has an entire field of data in MM/DD/YY format, and you wish to change this to a Date type in

order to obtain the special properties of this data type, all you need to do is MODIFY the STRUCTURE of the field. There is no need to create another field and use the CTOD function to replace the original field. This can be useful for converting ci-

ther dBASE II files or imported files.

2. Be extremely careful when using this data type in logical operands. If there is no date present in the field, and you are using an operand of any kind on this field, the record will not be selected. This is because the absence of a date yields a null variable rather than a 0 date. A null variable is neither greater than, less than, nor equal to any value.

To be safe, always include a second operand that will be true as the .OR. complement to your desired operand.

3. The month feature will work as a selection criterion with a date field for any given file. This can be particularly useful for searching anniversary dates.

Paul Zanutta  
New Hartford, New York

*dBASE III's Date data type has indeed caused a lot of confusion. Thanks for the tips. A word of caution is in order, though.*

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### dBASE—WordStar/MailMerge Connection

Users of both dBASE and WordStar/MailMerge might find it useful to use the two together to produce personalized form letters. However, certain peculiarities in each program require that special programming be used so that MailMerge sees what it needs to perform properly with all kinds of date types. Problems that often occur when attempting to use dBASE's facilities directly—without programming—include unwanted trailing blanks and, worse, embedded commas in the data file that confuse MailMerge to the point where it won't track the data correctly.

Both of these problems are corrected with the dBASE program in Figure 5. Basically, the program delineates field data with both quotation marks and commas,

an overkill method that is acceptable to MailMerge. It also strips trailing blanks using the TRIM function. As an added bonus, the program can be used with any data file simply by changing the names of the fields used within the DO WHILE loop.

Robert R. Carroll  
Woodland Hills, California

This short program can be used by both dBASE II and III users. (Note—EOF must be changed to EOF() for use with dBASE III.)

For the sake of clarity, an additional space is used between commas, single-quotes, and double-quotes in the listing. For proper results, do not include these spaces when typing the program into your system.

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#### Structure of SAMPLE.DBF

FLD	NAME	TYPE	WIDTH
001	HR_HRS	C	004
002	FIRSTNAME	C	015
003	LASTNAME	C	015
004	COMPANY	C	015
005	STREET	C	020
006	CITY	C	020
007	STATE	C	004
008	ZIP	C	005

```
*MAILFILE.PRG R.R. Carroll-- Converts data files for use with MailMerge.
USE sample.dbf
SET TALK OFF
SET RAM ON
SET ALTERNATE TO datatest.txt
SET ALTERNATE ON
DO WHILE .NOT. EOF
  ? " ", TRIM(hr_hrs) , " "
  ? " ", TRIM(firstname) , " "
  ? " ", TRIM(lastname) , " "
  ? " ", TRIM(company) , " "
  ? " ", TRIM(address) , " "
  ? " ", TRIM(city) , " "
  ? " ", TRIM(state) , " "
  ? " ", TRIM(zip) , " "
  ? " "
  SKIP
ENDDO
SET ALTERNATE OFF
RETURN
```

Figure 5: This dBASE program makes WordStar/MailMerge compatible with dBASE.



# User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.

## Fancy Shift Toggler

A submission to *PC Magazine's* Letters column in Volume 4 Number 9 explained how to force the CapsLock by using a small BASIC program. I wanted to be able to do this directly in a DOS batch file and wrote a small assembly language program called LOCK.COM to accomplish this.

LOCK.COM can set and reset CapsLock, NumLock, and ScrollLock in any combination with one command. For instance:

LOCK N+ C- S+

will set NumLock and ScrollLock and reset CapsLock.

LOCK C+

will set CapsLock.

The easiest way to make LOCK.COM is to create the file LOCK.INP, using any ASCII-compatible text editor, then get into DOS and type the following:

DEBUG LOCK.COM < LOCK.INP

LOCK.INP (in Figure 1) contains all the instructions for DEBUG to assemble the program, as well as the commands that name and write the file to disk.

Terje Mathisen  
Porsgrunn, Norway

This is a handy utility, and using DOS to redirect a "script" into DEBUG is a very slick way to create a file. Leave a blank line (with nothing on it but a carriage return) after the INT 10 line near the end of the LOCK.INP file—this is necessary for DEBUG to operate properly. Users can experiment with redirecting such pre-typed keystrokes through DEBUG to make all sorts of semi-automatic file changes. However, this works only with DOS 2.x or higher versions of DEBUG. Users of DOS 1.1 can run the BASIC MAKELOCK.BAS

```

a100
MOV     AX,CS
MOV     DS,AX
MOV     AX,0040h
MOV     ES,AX
MOV     SI,0001h
ES:
MOV     DI,[0017h]
MOV     CL,[0000h]
XOR     DH,DH
CMP     CL,00h
JZ      0163h
XOR     CH,CH

LDSB
CMP     AL,20h
JZ      015Ah
CMP     AL,4Eh
JZ      012Ch
CMP     AL,6Eh
JNZ     0130h
MOV     DH,20h
JMP     015Ah
CMP     AL,43h
JZ      0130h
CMP     AL,63h
JNZ     013Ch
MOV     DH,40h
JMP     015Ah
CMP     AL,53h
JZ      0144h
CMP     AL,73h
JNZ     0140h
MOV     DH,10h
JMP     015Ah
CMP     AL,2Bh
    
```

(continues)

**Figure 1:** LOCK.INP script file. Use DOS's COPY CON: or any straight ASCII text processor to type this sequence of instructions exactly as shown, hitting a carriage return at the end of every line, including the "blank" one following INT 20. Make sure DEBUG.COM is on your disk, and after saving the file, get into DOS and type: DEBUG LOCK.COM < LOCK.INP to create the LOCK.COM file.

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## USER-TO-USER

program in Figure 2 to create LOCK.COM. (Note another solution to this problem from Dan Briley, at end of the column.)

### Quick Text Editor

While using a different operating system on a friend's computer, I discovered a BUILD function that let me create text

files or short programs with ease. By using several DOS features, I created a batch file that emulates this BUILD command.

To use this, just type in the BUILD.BAT batch file in Figure 3, and then when in DOS, enter:

BUILD filename

(Substitute your own name for filename.) BUILD.BAT will clear the screen, display a ruler line, and save all your input in an ASCII file called filename. When you're finished entering text, simply hit the Z key while holding down the Ctrl key and then hit the Enter key—or just hit the F6 function key, which does the same thing. If a file with the same name as filename already exists, BUILD.BAT will rename it to have a .BAK extension. By specifying PRN: as the file name, all text entered is dumped to the current list device. This is useful for short memos or notes.

Since BUILD.BAT does not allow text to be edited except for the current line, it

```
JNZ      0150
OR       DL,DH
JMP      015A
CMP      AL,2D
JNZ      0163
MOV      AH,DH
NOT      AH
AND      DL,AH
LOOP     011F
ES:      MOV      [0017],DL
INT      20
MOV      DX,016C
MOV      AH,09
INT      21
INT      20
```

```
el6c "Use N+/N- to set/reset NumLock",d,a
el8c "C+/C- and S+/S- for Caps- and ScrollLock!",7,"$"
rcx
b7
w
q
```

(Figure 1 ends)

Figure 1: Continuation of LOCK.INP script file. Be sure to include a blank line after INT 20.

```
100 ' Program to create Terje Mathisen's LOCK.COM shift toggler
110 PRINT "Checking DATA statements; please wait..."
120 FOR B=1 TO 12:FOR C=1 TO 16
130 READ A$:TTL=TTL+VAL("H"+A$):NEXT
140 READ S:IF S=TTL THEN 170
150 PRINT "DATA ERROR IN LINE";B*10+220
160 PRINT "CHECK FIGURES AND REDO":END
170 TTL=0:NEXT:RESTORE
180 OPEN "LOCK.COM" AS #1 LEN=1:FIELD #1,1 AS D$
190 FOR B=1 TO 12:FOR C=1 TO 16
200 READ A$:LSET D$=CHR$(VAL("H"+A$))
210 PUT #1:NEXT:READ DUMMYS:NEXT:CLOSE
220 PRINT "LOCK.COM CREATED":END
230 DATA 8C,C8,8E,D8,B8,40,00,8E,C0,8E,81,00,26,8A,16,17,1820
240 DATA 00,8A,0E,80,00,30,F6,FC,80,F9,00,74,46,30,ED,AC,1846
250 DATA 3C,20,74,36,3C,4E,74,04,3C,6E,75,04,B6,20,EB,2A,1302
260 DATA 3C,43,74,04,3C,63,75,04,B6,40,EB,1E,3C,53,74,04,1301
270 DATA 3C,73,75,04,B6,10,EB,12,3C,2B,75,04,00,F2,EB,0A,1466
280 DATA 3C,2D,75,0F,88,F4,F6,D4,20,E2,E2,C3,26,08,16,17,1973
290 DATA 00,CD,20,BA,6C,01,B4,09,CD,21,CD,20,55,73,65,20,1529
300 DATA 4E,2B,2F,4E,2D,20,74,6F,2D,73,65,74,2F,72,65,73,1291
310 DATA 65,74,20,4E,75,6D,4C,6F,63,6B,0D,0A,43,2B,2F,43,1193
320 DATA 2D,20,61,6E,64,20,53,2B,2F,53,2D,20,66,6F,72,20,1108
330 DATA 43,61,70,73,2D,20,61,6E,64,20,53,63,72,6F,6C,6C,1430
340 DATA 4C,6F,63,6B,21,07,24,00,00,00,00,00,00,00,00,469
```

Figure 2: Alternative BASIC MAKELOCK.BAS program to create LOCK.COM.

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## USER-TO-USER

would not make a good replacement for a text editor. However, BUILD's ease of use greatly simplifies small tasks (especially for anyone that hasn't learned ED-LIN yet).

Andrew Krolick  
Carnegie, Pennsylvania

OK, this isn't WordStar, but it does allow

*you to create tiny batch files or write memos or address envelopes quickly and painlessly in DOS. And it's forgiving enough not to write over an existing file.*

### CapsLocker

Many times I've wished I had an automatic way to turn the CapsLock key on or off before I load certain programs. This can be

very handy when I'm entering a word processor, and I want to be in lower case, or when I'm entering a routine where I wish to have all upper case.

I've recently found a way to do this, which I have called CAPSON.COM and CAPSOFF.COM (see Figures 4 and 5). I include these files in small batch files, so I can have the desired upper or lower case

```
ECHO OFF
IF %1==PRN: GOTO START
IF NOT EXIST %1 GOTO START
REN %1,?????????.BAK
:START
CLS
ECHO      5    10    15    20    25    30    35    40    45    50    55    60    65    70    75
ECHO  -----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
COPY CON:=%1
:END
```

Figure 3: BUILD.BAT file that allows creation of other batch files, memos, etc. Hit Ctrl-Z or <F6> then <Enter> when done typing on it.

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## USER-TO-USER

to read as follows:

```
A>debug numoff.com
```

And third, change the one that reads

```
xxxx:0108 and al,bf
```

to read

```
xxxx:0108 and al,df
```

If you want to toggle on any of the toggleable shift keys, you can see what hex numbers to substitute after the

```
xxxx:0108 or al,
```

in the CAPSON.COM instructions, by running the following BASIC program:

```
10 'SHFTSHOW.BAS
20 DEF SEG=0
30 LOCATE 10,10
40 PRINT HEX$(PEEK(1047))
50 GOTO 30
```

and then pressing any combinations of left and right shifts, Ctrl, Alt, Ins, NumLock, CapsLock, and ScrollLock keys. (You'll have to hit Ctrl-Break to exit this small program when you're done.) The number printed on the screen follows the "or al," instruction at address 108. Remember this number; you'll need it below (where numl is mentioned). And remember to give any new toggle program its own new name.

Once you've created a program to toggle on a particular key, you can create a corresponding one to toggle it off. Follow instructions for CAPSOFF.COM (giving your new program a new name, of course). You can see what hex number to substitute after the

```
xxxx:0108 and al,
```

by getting into BASIC and typing:

```
PRINT HEX$(&Hnuml XOR 255)
```

substituting the hex number you chose in the SHFTSHOW.BAS program for the numl, and putting a &H prefix on it.

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# PC Tutor

Do you have a technical question about your PC? PC Tutor answers both elementary and advanced inquiries.

## To Re or Not to Re

**Q:** How can one decide if reformatting a hard disk is necessary when upgrading from one version of DOS to another? When it is necessary, what is the best way to go about it and yet retain all one's stored files?

Eric Kline  
Cincinnati, Ohio

**A:** The answer to your question is easy: as for I know, it has never been necessary to reformat a hard disk, and I've used 9 or 10 different versions of DOS.

The only exception I can think of is for the first two DOS versions (1.0 and 1.1). Since these did not support a hard disk, if you had special Version 1-compatible drivers for your hard disk, they might have required reformatting, for who knows what format the hard disk manufacturer used.

Since the introduction of DOS 2.0, hard disks can be supported in one of two ways. First, a hard disk can be supported with a DOS device driver. As for as I know, all versions of DOS beyond 2.0 support identical device drivers. Second, a hard disk can be supported through loadable BIOS drivers (the way the XT does it). This is not particularly a function of DOS at all and is guaranteed to work on all versions of DOS (unless Microsoft decides to stop supporting the XT and AT). Since the drivers work on all versions of DOS, your hard disk should also work on all versions of DOS.

When you switch DOS versions, there are some things you have to do, however. If you want a bootable hard disk, you will need to run the SYS program in order to copy the operating system to the root directory of the hard disk. Only disks supported via BIOS drivers are bootable.

Next, make very sure that all DOS pro-

grams ("External Commands," such as BASIC, FIND, SORT, CHKDSK, and the like) are updated to their new versions when you upgrade. Most DOS utilities will complain if you try to run them under the "wrong" DOS version, but there is no guarantee: they may crash, instead. I ease the transition by having a single directory called DOS in which I keep all DOS programs. When I upgrade to a new version, I just erase all files in \DOS and then copy one or both DOS diskettes into \DOS.

As for how to best keep files around if you ever do need to reformat your hard disk, the obvious way is run BACKUP to back up your hard disk, either onto floppy disks or onto a tape (if you have a tape system.) You then simply RESTORE after reformatting, just as the manual says. While I've heard rumors about incompatibility between backup floppies with different DOS versions, I haven't encountered any. The BACKUP/RESTORE cycle is obviously also necessary if your hard disk needs repairs. [Ed. note: The BACOPY utility in the Programming column in PC, Volume 4 Number 17, will let you back up all your files onto floppies, changing disks as they become full.]

## The Pace of Progress

**Q:** We recently converted from an IBM PC to an IBM PC-XT. All of our 1-2-3 files were copied to the hard disk without change. We have been surprised and disappointed, however, to find that the cursor now moves around the spreadsheets much more slowly than on the PC. All our other 1-2-3 commands are quicker on the XT (File Retrieve, Extract, calculations, macros, etc.). It's just the movement around the spreadsheets and data entry into an individual cell that is slower than it was on the PC. Do you have any idea what is causing this problem? We've been told the XT



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## PC TUTOR

is faster than the PC so this problem shouldn't be happening.

Martin Kurlander  
St. Louis, Missouri

**A:** The PC and the PC-XT run at the same rate of speed. Disk accesses are quicker on an XT, however, because the hard disk is so much faster than a floppy.

As for the slowdown you cite, I'd bet money that when you switched from the PC to the XT you also switched from a monochrome adapter to a color adapter. Programs must update the screen display on a color card more slowly than on a monochrome card; otherwise you get objectionable hashing/snow on the screen.

Your alternatives are to go back to a monochrome display/adapter or to get a color board that permits quick display updating. Two boards that can run faster are the IBM Enhanced Graphics Adapter and the Sigma Color 400 board. Getting the IBM Adapter to run quicker may be a significant task, however, since many programs that write directly to the screen check for color versus monochrome and adjust their speed accordingly.

### **Don't Add That Switch . . .**

**Q:** In the old days I had a switch connected to my 8-inch floppies that turned off their power when I wasn't using them. Now, my 5-inch floppy drives turn themselves off automatically after a few seconds, but the hard disk does not. Inspection reveals that the hard drive takes 5 V and 12 V; I assume 5 V is for the logic and 12 V for the motor. Should I install a switch on the 12 V line to the hard disk, or will that do nasty things to it?

Pulak Dutta  
Evanston, Illinois

**A:** You should not power down any portion of the hard disk except, of course, when you turn off your computer entirely. There is a great difference between the mechanics of a floppy disk and those of a hard disk. A floppy disk drive generally leaves the heads raised when the drive isn't running. Those whose heads stay down are designed for this application. In both cases the mechanisms are built for start-stop operation.

On a hard disk, the medium (disk) ro-

tates very quickly, causing the head to levitate. If you suddenly power down the motor, the head may drop to the surface of the spinning hard disk, often ruining a sector or two—especially if you have left the communications electronics on. Many systems have special power-down instructions, and some of the others have special control circuitry to move the head to a safe "landing zone" when you power down. Those that do neither run the risk of occasionally losing valuable information (although more-expensive hard disks are often more resistant to crashing).

There are other reasons for not powering down the hard disk, as well. For one thing, hard disks take a fair amount of time to get up to speed, and you would need to wait every time you wanted the hard disk to be accessible. Also, it is not at all certain that powering down the hard disk will extend its life. Some people believe you should leave hard disks on constantly. It may wear out the motor a bit quicker, but the rest of the hard disk (heads and media) could conceivably last longer.

### **. . . Or Touch That One**

James Carroll, now Automation Librarian at North Dakota State University, adds an interesting comment to the discussion about leaving power on (PC, Volume 4 Number 11).

At the University of Iowa, the Computer Center encouraged people who heavily use their PCs to leave them on all the time. One reason was ease of use: the PCs didn't use that much electricity, so you could just turn the screen down at night and turn it back up during the day. The main reason, though, was maintenance. In addition to possibly blowing out components through voltage surges during power-up, the people at the Computer Center found that the part with the highest failure rate was the on-off switch! By leaving the computer on, people didn't break the switch.

Interesting, too, the part with the second highest failure rate was the B: drive. The Computer Center claimed that this was because the B: drives were A: drives that had been removed, repaired, and later installed as B: drives. (At the time this happened, most PCs being sold were single-drive systems.) The problem grew so severe that the Computer Center had a

## PC TUTOR

policy of burning in new PCs for 30 hours before delivering them to the departments that had ordered them.

### Keys for the Locks

**Q:** Before executing a program from a BAT file, I'd like to check the status of the NumLock and CapsLock keys. If possible, I would like to be able to set them either on or off (via an interrupt call in Assembly), depending upon the application that follows. Is there a way in assembly language to return the result of MOV AH,28h and INT 16h into the error level of the batch program, and what values would I use?

Ira Rudowsky  
Brooklyn, New York

**A:** What you need to do is call the keyboard interrupt (INT 16h) and check the shift status, which is returned in register AL. The register bits are:

40h—caps lock on  
20h—num lock on

AH=4C is the return call for DOS, with AL=error level.

Quick and dirty applications like this are most easily written with DEBUG. Typing in the underlined keystrokes below will create a short program that checks the Caps Lock status. (The .xxxx segment of the addresses will vary from one machine to the next.)

```
A>DEBUG CAPSCHK.COM
file not found
->
xxxx:0100 MOV AH,02
xxxx:0102 INT 16
xxxx:0104 TEST AL,40
xxxx:0106 JNZ 010C
xxxx:0108 XOR AL,AL
xxxx:010A JMP 010E
xxxx:010C MOV AL,01
xxxx:010E MOV AH,4C
xxxx:0110 INT 21
xxxx:0112 <blank CR>
-BX
CX 0000
:12
-N
Writing 0012 bytes
-Q
```

At lines 100 and 102, the program calls the keyboard interrupt to see which shift keys are down. Line 104 checks the result to see if CapsLock is down (40hex). If so, it sets AL to 1; otherwise, to 0. Then the program exits to DOS with the error level equal to the AL value. Note: in DEBUG you must

set CX to the size of the program (12 bytes [hex] in this case) before writing the file. The correct number of bytes to enter is shown by the address of the byte at which you stop assembling by entering a blank carriage return.

If you wanted to check NumLock rather than CapsLock, just change line 0104 to:

```
test AL,20
```

To check for either lock status on, change line 0104 to:

```
test AL,60
```

Run by itself, this program won't put any information on the screen. To use it, just put the following lines in your batch file:

```
ECHO OFF
CAPSCHK
REM - error level 1 if CapsLock on
IF ERRORLEVEL 1 ECHO CapsLock is on
```

To set the NumLock or CapsLock under program control, you need to change the value at 0040:0017 appropriately (1 = on, 0 = off). Using the same DEBUG procedure that is shown above, construct a new command (call it, NUMCHG.COM, for example) to turn on NumLock by ORing the 20h bit in that byte. The program lines would be:

```
mov AX,40
mov ES,AX
mov BX,17
ES:
or byte ptr [BX],20
mov AX,4C00
int 21
```

To turn off NumLock, just remove that bit:

```
move AX,40
mov ES,AX
mov BX,17
ES:
and byte ptr [BX],DF
mov AX,4C00
int 21
```

Note both of these programs quit with 0 error level (AH=4C, AL=0).

The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

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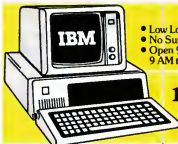
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# Reviews in Brief

## WindowDOS Frames Your Files with New Commands

BY JAMES LANGDELL

WindowDOS is a utility program that replaces the blank slate of DOS's A> prompt with a window that gives a clear view of the available commands and files. Once WindowDOS is loaded into background memory, you can call up the window while in DOS or in the midst of running another program by pressing Ctrl-Ins.

The main window has panes for 85 file and subdirectory names at a time; two more pages allow WindowDOS to display up to 255 names from a single directory. When a highlight cursor rests on one of the filenames, more-detailed information about that file appears at the top of the screen. WindowDOS commands can act directly on the highlighted file or you can enter another file's name.

You can execute each of the 11 commands listed at the bottom of the main screen by entering its initial letter. Of these, Erase, List, MakeDir, Rename, and Tree operate much the same way as their DOS counterparts.

However, the other six commands furnish new powers: Sort can order the directory's filenames by creation date, size, or alphabetically by filename or extension. View lets you examine a file's contents as hexadecimal values. Dir displays a list of the filenames in a subdirectory you select. Find lists all filenames that fit a filespec you give, even if they must be found in other directories. Purge and Copy can erase or reproduce a batch of individual files that you've marked with a plus sign



WindowDOS gives a menu of filenames that shows directory names in bold.

(+) in their directory window.

Function keys deliver other WindowDOS utilities, some of which control printer output and hide or protect files. F7, for ex-

ample, lets you lock the keyboard with a password, but this does not protect you against a Ctrl-Alt-Del reboot.

I was able to use Window-

## MindReader May Know What You're Thinking

BY JAMES LANGDELL

MindReader is a word processor designed for people who don't know how to type. Once such a user manages to hunt and peek the first few letters of a word, MindReader will help complete it by displaying a window that suggests several words with the same beginning. If one of these was the word in the user's mind, a single keystroke can call it onto the screen.

Other single-key commands can fine-tune this word by making it plural, changing it to past tense, or adding *ing* or another

ending selected from a list of suffixes. This feature has some grammatical failings; *MindReader's* past tense for *go* is *goed*. You can add words to the window's dictionary or have the program learn to suggest words in a sequence that reflects which ones occur most often in your writing.

The program's 30 operating and editing commands are entered using the ten function keys along with Shift and Alt. These commands are displayed on the screen at all times in a compact format that leaves 20 lines for

(continued)

DOS successfully while running WordStar, PC-Talk, and BASIC programs. The window couldn't open while I used XyWrite, as is the case when most background programs come up against that word processor, but WindowDOS still operated perfectly when I returned to DOS from XyWrite.

WindowDOS made file operations easier to do with no loss in speed in most situations. But when the current directory was very large, it took noticeably longer to call up the main window and to Copy, Erase, and Purge files. Each time you use these commands, WindowDOS pauses to reread the entire directory to update the screen. It took 45 seconds to call up the window when the directory contained 230 files, although with smaller directories the window had appeared within 3 seconds.

Unlike desktop utility programs such as Borland's SideKick, WindowDOS's functions don't stray far from those already offered by DOS. Instead, it significantly expands the situations where you can draw on the operating system's powers.

WindowDOS Associates claims its program is compatible with SideKick. I found I could load both into background memory and call either's window up while running another program, but I'd have to exit from one utility before calling on the other.

### WindowDOS

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Program Size: About 40K

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# ProENT's Half-Size PC Keyboard Proves That Smaller Isn't Enough

BY JAMES LANGDELL

It's sad when somebody starts with a good idea, then crushes it by doing too many other things. That seems to be the case with the ProENT keyboard for the IBM PC.

At the core of this product is a key arrangement that makes it easier to work on spreadsheets. The ProENT keyboard's cursor keys are separate from the numeric keys, which eliminates a flurry of activity around the NumLock key.

A good idea. But, rather than making a simple keypad for spreadsheets alone, ProENT brainstormed a way to replace the PC's 84-key keyboard with a plug-compatible, half-size keyboard that has a mere 55 keys. That's even fewer than IBM used on the PCjr's 62-key keyboard.

IBM cut corners by having its row of number keys double as the PCjr's function keys. Going even further, ProENT forced its



The ProENT keyboard squeezes all the PC's functions out of only 55 keys.

alphabet keys to do quadruple duty. Each of these 13 keys can produce two letters, as well as a pair of punctuation marks or digits.

Your middle finger, for example, will press the same key for either N, U, 5, or a percent sign. To get the latter three characters, you must also hold down

a key to select one of three modes—MUP mode, 456 mode, and 5% mode, respectively.

As you may guess, the alphabet arrangement bears no resemblance to the traditional QWERTY keyboard, designed in 1873. ProENT advocates rebellion against that deliberately finger-slowness system. A similar philosophy lies behind the Dvorak typewriter keyboard, but ProENT didn't emulate that facile key arrangement either. Instead, the ProENT keyboard has text and data entry done by the right hand alone while the shift, editing, and command keys are strictly the left hand's domain.

Besides fighting the war against QWERTY, ProENT's creators seemed over-concerned with eliminating keys to make their product half the size of the PC's keyboard. Their achievement here is rather dubious, since most users probably care less about having a small footprint on their desktop than having sufficient room for their hands on the keyboard.

Even the space bar has been reduced to a mere nubbin. It also has to be used, along with the 456 mode key, when you need to type a zero (0).

The right thumb's least ergonomic experience occurs at the end of a sentence. If the last letter in a word was in the second alphabetic set, the thumb has to bend way in from the MUP mode key to strike the period key, then reach out again to hit the small space key twice.

ProENT includes a tutorial diskette that gives you practice at touch typing on its renegade keyboard. Unfortunately, typing for several hours this way might prove to be good, although unintentional, training for pitching the split-fingered fastball.

## MindReader

(continued from preceding page)

displaying text. Since *MindReader* is tailored for writing business letters, some word processing features were omitted to simplify that application. Pages are fixed at a 65-character width, and the maximum document length is 300 lines. You can mark underlined and boldfaced text or, when ready to print, call for an entire letter to be boldface.

A competent typist might feel distracted when *MindReader* flashes its unneeded windows several times a second, especially because this intense screen activity causes the text to lag behind your fingers. The program also has, literally, an excess of bells and whistles—arcade-style sound effects that accompany any keystroke or operation outside of normal text entry. Fortunately, *MindReader*'s dictionary windows and

"super audio" can be easily turned off, leaving other features that can speed up even an already facile typist.

A glossary file can store up to 260 frequently used phrases, sentences, and paragraphs that you can order with three keystrokes: F8, a letter, and a number. Another timesaver is to establish a closing signature block that the program will insert in a business letter at a single keystroke. You can also maintain a "Rolodex" file with up to 23 names, addresses, phone numbers, titles, and salutations. You can call up this data while writing or draw on it automatically when printing form letters and envelopes through *MindReader*'s simple mail-merge feature.

Compared to more expensive word processors, *MindReader*'s most serious lack is the absence of a free-form insert mode that allows new text to fit in wherever the cursor is. Instead, new

text wipes out the characters underneath unless you press the Ins key, which allows you to enter text at that one spot. When you're writing an insert, the text to the right of the cursor drops to the bottom of the screen until you press the Ins key again. The document then reforms to accommodate the additional text.

Even without a flexible insert mode, *MindReader* might win over an experienced typist with its boilerplate features. And a once-frustrated hunt-and-pecker, now able to create a passable business letter, might never know what he's missing.

**MindReader**  
Businesssoft, Inc.  
703 Giddings Ave., M-4  
Annapolis, MD 21401  
(301) 263-1962  
Requires: 256K RAM  
List Price: \$189

Circle 632 on Reader Service Card

**ProENT keyboard**  
ProENT Co.  
8350 N. Lincoln Ave.  
Skokie, IL 60077  
(312) 676-1080  
List Price: \$198, including  
tutorial disk

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EDITED BY DAVID OBREGON

# New on the Market

## Datacopy 620 EDC Camera

Datacopy has released a new model in its Series 600 line of Electronic Digitizing Cameras (EDC). The Model 620 EDC has a resolution of 3,456 by

tem is the Model 110 Image Processing Interface and Datacopy's Word Image Processing System (WIPS) software. WIPS controls image scanning, storage, retrieval, and printing. It also permits captured images to be integrated with document



4,472 8-bit picture elements. This resolution allows the camera to capture such images as photographs and complex technical drawings accurately.

Software support includes programmable-image windows, scan modes, and scan rates. The camera can be set to scan an image continuously or incrementally by individual picture element. Scanning times range from under 40 seconds per frame in the continuous mode to close to infinity in the incremental mode, allowing the user to optimize the rate to the PC equipment used.

Models 620 and 620F are available for the Integrated Imaging Systems models 92 and 920, respectively. These combine the EDC with a copy stand, lighting system, and power supply. Also included with the sys-

tem is the Model 110 Image Processing Interface and Datacopy's Word Image Processing System (WIPS) software. WIPS controls image scanning, storage, retrieval, and printing. It also permits captured images to be integrated with document

files prepared using standard word processors, printable by impact or laser printers.

**List Price:** 620 or 620F EDC alone, \$11,950 and \$13,950, respectively; Models 92 or 920 Integrated Imaging Systems, \$14,950 and \$16,950.

**Datacopy Corp.**

1215 Terra Bella Ave.

Mountain View, CA 94043

(800) 556-1234, ext. 96

(800) 441-2345 in Calif.

(415) 965-7900

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## Nastec CASE 2000 Environment

Nastec Corp. has released its Computer-Aided Software Engineering (CASE) package, the CASE 2000 Environment, for professional software develop-

ers. The Nastec CASE 2000 Environment consists of several integratable DesignAid tools for program development and a series of choices for configuring the system to particular PC equipment.

The individual components of the DesignAid software include:

- **GraphiText**—A full-screen editor with integrated graphics, text, and file-nesting facilities. This software provides complete documentation support, as well as a method for managing ideas. The file-nesting feature allows the software developer to call up a global view of the system under development.

- **Design Dictionary**—An object dictionary containing design elements as well as data elements. Incorporating interactive updating/inquiry facilities and reporting features, this component allows the user to develop reusable applications modules from elements stored in the dictionary.

- **Design Analyzer**—A validation program for scanning data flow diagrams and COBOL source statements to ensure correct usage and syntax.

- **LifeCycle Manager**—A project management program designed specifically for software developers. This component combines a database management system that can be shared by the other components listed above with a control program that automates project planning and estimating, status tracking, documentation preparation, and quality assurance.

Operating environment choices available include direct access to mainframe systems via RJE and 3270 controllers, networking facilities, and individual PC-to-PC links. The Nastec CASE 2000 Environment is designed as an open system, able to accommodate additional tools and management controls.

**List Price:** DesignAid, \$6,900; required graphics board, \$895

**Requires:** 256K RAM, 10 MB hard disk, PC-DOS, graphics board.

**Nastec Corp.**

24681 Northwestern Hwy.

Southfield, MI 48075

(313) 353-3300

Circle 647 on Reader Service Card

## 4-5-6 World Catalog

Users of Lotus's 1-2-3 will find the 4-5-6 Lotus Enhancement Catalog a welcome source of add-on materials. This direct-mail catalog includes over 400 products in 55 distinct categories, extensively cross-indexed. Products listed in the paperback-size directory include 1-2-3 enhancements, applications templates, software tutorials, books, and accessories.

In addition to the catalog, 4-5-6 World maintains a current database of all known Lotus enhancement products. Orders for products can be made by mail or phone.

**List Price:** Free

**4-5-6 World**

P.O. Box 22657

Santa Barbara, CA 93121

(800) 524-5678

(805) 564-2424 in Calif.

Circle 653 on Reader Service Card



4-5-6 World Catalog,  
4-5-6 World

## BL Series Work Stations

Electronic Systems Furniture is offering a line of work stations that can accommodate any microcomputer equipment currently on the market. BL (Bi-Level) Series Work Stations

steel tip. It is available in either 4- or 6-inch illuminated lengths, or with a special 90-degree tip.

**List Price: \$16.95**

**FST, Inc.**

P.O. Box 201239

Austin, TX 78720

Circle 650 on Reader Service Card



BL Series Work Stations, Electronic Systems Furniture Co.

feature heavy-gauge steel construction with high-pressure laminate tops (see photo above).

The individual components can be mounted on casters for mobility. Tops can be ordered in oak-, putty-, or walnut-colored laminates, with bases enamelled in either putty or black.

**List Price: Varies according to model.**

**Electronic Systems Furniture Co.**  
17129 S. Kingsview Ave.  
Carson, CA 90746  
(213) 538-9601

Circle 638 on Reader Service Card

## Pin Pusher

Users frustrated by difficult-to-set DIP switches in their equipment may welcome a solution offered by FST, Inc. The Pin Pusher can access and illuminate any switch. The pen-like device has a high-intensity light source and a 1/16-inch diameter

## PC Guardian

Janrick Associates is offering an RFI/EMI filter/surge suppressor in a configuration that's also designed to house the IBM PC's keyboard when not in use. The device has six protected power outlets and features an all-metal construction strong enough to support the IBM PC systems unit and monitor.

**List Price: \$99**

**Janrick Associates**  
P.O. Box 361782  
Melbourne, FL 32936  
(305) 773-2405

Circle 642 on Reader Service Card

## Word Finder

Writing Consultants has released a number of new versions of their *Word Finder* thesaurus program. In addition to the versions for *WordStar* and *MultiMate*, versions of the software are now available for *Microsoft Word*, *Word Perfect*, *WordStar*

2000, *pfs:Write*, and *IBM Writing Assistant*.

*Word Finder* locates synonyms directly from within the word processing program while the user is either creating or editing a document. Synonyms are displayed in a window on-screen and can replace the original word in the document automatically. *Word Finder* contains more than 90,000 synonyms for 9,000 key words.

The RAM-resident program can be used alongside such other background utilities as *SideKick*, *SmartKey*, and others. The thesaurus function doubles as an on-line dictionary, permitting the user to confirm both a word's meaning and spelling.

**List Price: \$124.95**

**Requires:** 30K RAM above the amount used by your word processor; two disk drives, PC-DOS, word processor.

**Writing Consultants**  
11 Creek Bend Dr.  
Fairport, NY 14450  
(716) 377-0130

Circle 651 on Reader Service Card

"week at a glance" view of schedules with a summary of each activity. Recurring events can be scheduled automatically by the day, week, month, or year, and any group of events may be moved or copied within one calendar or to another calendar.

*Time-Keeper* also features a conference finder and allows the user to search calendars for open time slots. Other features include user installation options, password protection, calendar print functions, and on-line help screens.

**List Price: \$195**

**Requires:** 192K RAM, one disk drive, PC-DOS 2.0.

**DuraSoft**  
7210 Washington Ave.  
New Orleans, LA 70125  
(504) 486-6081

Circle 658 on Reader Service Card

## EasyLAN

A software-based local area networking system that links PCs together at a cost of less than \$100 per station has been announced by Server Technology. Called *EasyLAN*, the software allows multiple PCs to share printers at maximum print speeds and to transfer files between users at rates up to 19.2K bits per second.

*EasyLAN* will support as

## Time-Keeper

DuraSoft has introduced a professional appointment scheduler that features multiple, individually programmable calendars. It shows appointments or events graphically, allowing a



Time Keeper, DuraSoft

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many as 10 single-user PC systems connected directly to each other by RS-232 serial lines, as well as up to three printers and 18 separate communications ports per attached PC. It also allows connections to PCs via modem at rates up to 9,600 bps.

Individual users can run software applications concurrently with EasyLAN operations. All print spooling and data transfers are carried as background operations, minimizing the impact of these operations on total system throughput.

An EasyLAN network can be set up quickly by attaching the cable supplied with the software to the RS-232 ports of each PC. If more than two PCs are to be interconnected, a "star" configuration where one PC serves as a focal point to which the other stations are linked is used.

Software installation of EasyLAN simply requires loading the appropriate commands in the AUTOEXEC.BAT file of each linked PC. Configuration statements can tailor the network to specific requirements, such as designating the levels of security to be permitted to each station and the extent of password controls within the system. Restrictions can also be placed on disk and directory access to remote PCs.

**List Price:** Two-User Starter Kit, \$179.95

**Requires:** Each PC: 128K RAM, one disk drive, PC-DOS 2.x.

**Server Technology**  
1095 E. Duane St.  
Sunnyvale, CA 94086  
(800) 835-1515  
(408) 738-8377

Circle 652 on Reader Service Card

## HardRunner

Hard disk users wanting to run Lotus's 1-2-3 or Symphony software without putting the system disk in drive A: will find *HardRunner* from Nostradamus a welcome utility. The utility self-installs in under 30 seconds and makes no alterations to the copy-protected programs.

The utility boots up a version of the Lotus software that has been copy-protected on the user's hard disk. This permits the

master program diskette to be stored away for safety, while preventing anyone from making unauthorized copies of the software on the hard disk.

**List Price:** \$34.95

**Requires:** Lotus's 1-2-3 or Symphony.

**Nostradamus**  
P.O. Box 3167  
Ogden, UT 84409  
(800) 453-8503

Circle 648 on Reader Service Card

## AutoCAD Applications Catalog

Autodesk has released a compendium of over 80 programs that tailor the AutoCAD graphics system to specific applications areas. The *AutoCAD Applications Catalog* lists programs for engineers in architecture, electricity, electronics, chemistry, civil, structural, and construction mechanics. It also includes programs for facilities planning, graphic database translation, general drafting, and theatrical lighting.

The *Catalog* lists programs under four major categories: Autodesk products; Autodesk-supported products that have been reviewed, tested, and are being distributed by Autodesk; Autodesk-qualified products that are available through software vendors; and AutoCAD-compatible products also available through software vendors.

**List Price:** Free to licensed users.

**Autodesk Inc.**  
2658 Bridgeway  
Sausalito, CA 94965  
(415) 331-0356

Circle 640 on Reader Service Card

## QIC-II Cleaning Kit

Users of 1/4-inch cartridge tape drives now have an alternative to cleaning the read/write heads on their drives manually. PerfectData's QIC-II Cleaning Kit works on the 1/4-inch tape used with 5 1/4-inch or 8-inch format factor drives.

In use, the cleaning cartridge's leading pad is moistened with the solution that comes with the kit and is insert-

ed in the drive. Within the drive, the pad moves across the heads 10-20 times, ensuring the removal of dirt and residues.

**List Price:** \$39.95

**PerfectData Corp.**  
9174 Deering Ave.  
Chatsworth, CA 91311  
(818) 998-2400

Circle 641 on Reader Service Card

speed of up to eight pages per minute (approximately 350 characters per second). It also provides 300 dots-per-inch resolution, with the ability to mix multiple font styles and graphics on a page.

The standard QuadLaser is supplied with seven different font styles in ROM and a full library of 20 fonts on diskette. In



Voltfree CRT Filters, Sun-Flex Co., Inc.

## Voltfree CRT Filters

Sun-Flex Co., Inc., has produced an antiglare CRT shield that also reduces the low-frequency radiation and electrostatic charge created by many CRT monitors. The radiation and static electrical charges are suppressed by a grounding mechanism built into the Voltfree's monofilament mesh filter.

**List Price:** Varies according to monitor size.

**Sun-Flex Co., Inc.**  
20 Pimental Ct.  
Novato, CA 94947  
(415) 883-1221

Circle 644 on Reader Service Card

addition, the printer's font editor enables the user to create custom fonts and logos in an almost unlimited range of possible styles.

A built-in print buffer of 256K RAM can be expanded to 2 MB, equivalent to 1,000 standard typewritten pages of buffer memory. Besides printing complex bit-mapped images, the extended memory capability allows the user to download control programs to the printer, making it possible for the QuadLaser to emulate other printers.

The printer is equipped with both serial RS-232 and Centronics parallel interfaces. It can be used by single-user systems or linked to multiple-user networks, and operates at a low noise rate of 55 dB.

**List Price:** \$3,795

**Quadram Corp.**  
4355 International Blvd.  
Norcross, GA 30093  
(404) 923-6866

Circle 656 on Reader Service Card

## QuadLaser

Quadram's new, competitively priced laser printer offers an alternative to large-system impact printers and laser printers from other manufacturers. Features of the QuadLaser include a built-in font editor and a print

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## COMING UP



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## Virtual Device Interface

VDI, the ANSI proposal for a standard graphics interface, can provide a consistent facade to any graphics device and can thereby save programming time and actually improve the quality of the output on many devices. *PC Tech Journal* takes an in-depth look at VDI, examining two VDI drivers, IBM's *Graphics Development Toolkit* and *GG5-Drivers* from Graphic Software Systems.

## Evaluating Internal Modems

*PC Tech Journal* evaluates 13 internal modems for the PC based on compatibility, performance, hardware and software features, product and documentation quality, and ease of installation, setup, and operation.

## R:BASE 5000

Microrim describes its *R:BASE 5000* as a powerful, fast, and easily installed database manager. *PC Tech Journal* evaluates the product as part of an ongoing series of reviews of database managers as development tools.

## FORTRAN Compilers

*PC Tech Journal* examines four FORTRAN compilers for the IBM PC and compares them according to their compliance with the ANSI standard as well as other important considerations. The compilers include Digital Research's *FORTRAN-77*, IBM's *Professional FORTRAN*, Lahey Computer Systems's *F77L*, and *Microsoft FORTRAN*.

## Applications for TK!Solver

An engineer looks at *TK!Solver* as a modeling tool.

# Telecommunications: The Net Effect

Telecommunications will affect the way we relate to each other in the Information Age. Kruglinski takes a factual approach to the subject, while Gengle presents a more personal view.

**R**eaders of *The Netweaver's Sourcebook* are likely to feel a rush of ecstasy after a cursory glance at the table of contents and appendices. Unfortunately, appearance and reality are two different things.

The author, Dean Gengle, is co-developer of The CommuniTree Group, a telecommunications and software company in San Francisco. He begins with the premise that "our society has one foot in the Information Age and the other in the 15th century."

Gengle sees networking and the higher function of "netweaving" as nothing less than how we relate to each other and to the world. Though the book is subtitled "A Guide to Micro Networking and Communications," its first two-thirds dwell on the newspeak of the Information Age as applied to individual and group psychology.

Gengle has a gift for crafting appealing rhetoric. For example, in making the point that reality is conditioned by lan-

guage and that human culture has traveled far beyond anything strictly natural, he says, "Nonetheless, we twine a web of sustaining mathematics around it all and pretend that we are being 'realistic.'"

Frankly, I've always had a weakness

goes, but he doesn't say what to do with this list once you make it.

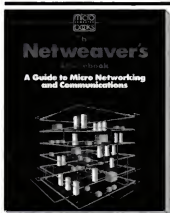
Gengle apparently aspires to being an interpreter of our age. Though well intentioned, he hasn't really developed the intellectual tools for the task and hasn't done anywhere near enough homework. Here's what he asks us to do: "The following metaprogramming checklist should be referred to during any planning process: 1) Make sure your goal(s) are framed in Information Age concepts. If you have not done so already, using the concepts in this sourcebook, reframe your life and business in Information Age terms. . . ."

## New Age Manifesto

This book, like many other New Age manifestos, celebrates slaphappy predictions of the future at the expense of conscientious observation and sober judgment. The fact that I agreed with many of his conclusions only made me wonder whether I was becoming a techno-flake too.

You get the feeling that Gengle is someone who loves to play with word-pictures and who probably considers the problems of real people a little too depressing to get involved with. All his grandiose predictions seem written with tongue in cheek, as if we're supposed to vicariously enjoy the kick he gets from putting something over on us.

Only in the last 70 pages do you get to anything that has any practical application in the field of microcomputers. Gengle certainly knows what he's talking about here, though. I wish he'd given



for Mensas like Gengle. His book seems dictated by some superintelligent E.T. and often leaves you with the impression that it's you who are not following the thread rather than that the presentation itself is threadbare. For example, he has you make an "Information Resource Assessment profile checklist," a list of the magazines you read, the TV programs you watch, the radio stations you listen to, the market trends you track, the type of junk mail you save or notice, and so on. The exercise is intriguing as far as it



**The Netweaver's Sourcebook:  
A Guide to Micro Networking and  
Communications**

Dean Gengle

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## BOOK REVIEW

us more of the good stuff and left out the proselytizing.

Each chapter has an appendix giving candid reviews of interesting books that Gengle has read, not all of which he rec-

ommends. Many of his comments verge on the obscure, such as "This is a book about equilibrium and the taming of technology. Dance with it." Still, these appendixes constitute a literate and often

absorbing catalog of pop thinkers, like Alvin Toffler, with a few serious ones like Pierre Teilhard de Chardin thrown in to flavor the sauce. Most of the authors are glossed over and their views oversimplified, but what Gengle lacks in depth, he makes up in breadth.

Gengle concludes his book with the following crescendo: "All appliances will become, willy-nilly, information appliances. The planet's ecology, technology, and information will merge. That which was last is now first. A perpetually new beginning in the Eternal Present. Omega."

### Data Communications

Many amazing but true statements appear between the covers of David Kruglinski's superlative *The Osborne/McGraw-Hill Guide to IBM PC Communications*. Most entertaining of all is its chapter on the early history of data communications—a somewhat unique addition to a book aimed at an audience of personal computer users. The author's encyclopedic knowledge and detailed coverage of this subject make the book one of the best of its type. (Kruglinski, who also wrote *Data Base Management Systems*, has a master's degree in electrical engineering.)

In the *Guide to IBM PC Communications* Kruglinski uses a diversified approach to present all the necessary facts, including discussions about current trends, studies, and books. To illustrate the impact of electronic communications, for example, he quotes a study that found that one out of three small children, when given a hypothetical choice, preferred giving up their fathers to their television sets. Discussing the pervasive impact of communications, he notes that although anyone can list any number of wildly successful media ventures, only the picture phone and quadraphonic sound come to mind as notable failures.

Kruglinski also discusses recent works that have influenced his thinking, such as Toffler's *The Third Wave* and John Naisbitt's *Megatrends*. He finds Naisbitt's discussion of interpersonal networking valuable, for example, because it relates to such phenomena as the replacing of traditionally rigid management hierar-

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chiefs with workers' quality circles and other "horizontal structures." This section reminds me of what one editor once described as matrix management. Although such restructuring may sound like a nirvana for buck passers, its goal is simply to have everyone coordinate well with everyone else. Of course the key to this coordination, especially with geographically distributed organizations, is telecommunications.

And Kruglinski appears to have done some journalistic legwork as well. How else could he have known that Microsoft employees do not send written memos or make phone calls; instead, they send messages to each other electronically from terminal to terminal.

#### Scandalous Claims?

For me, the most interesting chapter is the thumbnail history of communications, which begins by mentioning some of the precursors to the telegraph that appeared in Europe, like the windmill-like contraptions secured to rooftops that were used in the late 1700s to signal the results of military battles from one town to the next. He then risks scandalizing his readers by claiming that "Morse's real problem was that he didn't know the basic laws of electricity" and that the code bearing his name was actually devised by Alfred Vail.

The rest of the book is equally informative. Instead of talking down to his readers, Kruglinski reassures you that you will not be forced to endure yet another dry explanation of bits and bytes.

Despite its reluctance to compare bits versus bytes, in every other way, the *Guide to IBM PC Communications* luxuri-

ates in a rich tapestry of pertinent detail. Almost all readers will certainly skim some chapters without mishap. But all readers will want to keep the book on their shelves for the day when they need

that little tidbit of information that they can't find anywhere else. ■

*Dean Hannotte is a frequent contributor to PC Magazine.*



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### PC

#### The Osborne/McGraw-Hill Guide to IBM PC Communications

David Kruglinski  
Osborne/McGraw-Hill  
2600 Tenth Street  
Berkeley, CA 94710  
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Copyright: 1984  
Cover Price: \$15.95  
ISBN: 0-88134-126-6

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At that time, Wabash diskettes were synonymous with "zero". Just saying that quality control was poor would be charitable.

So much was wrong that DISK WORLD wouldn't sell them.

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Kearney-National Inc., a \$202-million division of a much larger company, came into Wabash.

Out went the old management, the old methods, the old production techniques... and in went a lot of new people, ideas, production lines and some really imaginative thinking.

### The end result.

Today, I'm proud to offer you the Wabash Pinnacle Series of diskettes at the prices shown.

This isn't evolution in diskette manufacturing; it's revolution.

### Here's what you get.

Wabash Pinnacle diskettes are certified 100% Error Free... are covered by a LIFETIME WARRANTY... meet or exceed all industry specifications (by quite some distance)... and are simply the best value in diskettes available today.

### The torture test.

Considering Wabash's earlier dubious reputation, I wasn't exactly a true believer when their Director of Marketing came only my office with samples.

So I took a box at random, selected a disk, bent the thing every which way and slipped it into my IBM PC.

### That wasn't enough.

I gave samples of the diskettes to Curt Rosenbach and, in turn, to Tom Street, both hackers of long experience and members of the Waikana (Illinois) Apple Users Group.

Tom really went at it.

We took a quartz-halogen lamp, aimed it at the diskette until it started to smoke (and melt)... and then formatted, booted the diskette and stored and retrieved data.

The same terribly (and intentionally) mutilated diskette ran on an ITT, Corona and IBM.

Curt was nice.

He simply bent the diskette every which way... and it still formatted, booted and ran on his Apple.

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DISK WORLD!, Inc. sells more flexible magnetic media by mail-order than anyone else in the world.

As President of the corporation, won't tolerate a product with a failure rate of more than 1/1000th of 1 percent.

I also don't like companies who try to make a "quality" or "premium" image for a higher price like Dyan and Verbatim did... until they failed.

As President of DISK WORLD!, Inc., my motto is simple: "The best diskette for the least amount of money."

### Wabash is it.

Right now, there is no better value than the Wabash Pinnacle Series of diskettes.

Granted, you have to buy a hundred at a time, but so what? Split the order with friends, relatives, co-workers or even your worst enemies.

The key thing is to get the most diskette for the money. And this is it.

(Incidentally, as a corporation, we put our money where our



mouth is. Our first order for Wabash Pinnacle Diskettes was 1.5 million units.)

That's an awful lot of faith and confidence. But, then again, I have the diskette that Tom Street (happily) mailed... and kept on running.

### The truth about \$1.00 or less diskettes.

More and more ads are popping up offering diskettes for \$1.00 or less.

By the same token, more and more people who were selling used cars a few months ago are now selling diskettes by mail.

We did a little survey of current ads for diskettes advertised for a dollar or less and done analysis of the market and here's what we found as it applies to 5.25" DSDD diskettes "supposedly" selling for a dollar or less.

	ADVERTISED	ACTUAL		ACTUAL
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	99 ea.	1 02 ea.	Unspecified	
Communications & Electronics	49 ea.	80 ea.	Unspecified	
Precision Data	89 ea.	93 ea.	Unspecified	
Diskette Connection	53 ea.	93 ea.	Unspecified	
Comp Soft Serv	77 ea.	77 ea.	Unspecified	
			+ ship	
Computer/Computer	99 ea.	99 ea.	Unspecified	
DISK WORLD	89 ea.	92 ea.	Wabash	
			Datatech	

### The real truth about \$1.00 or less diskettes.

It costs all diskette manufacturers about the same to produce a diskette. Some may charge more because they want to protect a "premium quality" image, at the late, lamented Dyan who bought their basic media from 3M.

Some charge less because they sell a sub-standard product... and we're not foolish enough to name names here.

But here's the truth about the \$1.00 or less diskette market. It falls into four categories.

1. The DISK WORLD! of the universe who simply are so big that they can buy first quality product in massive quantities and choose to pass on the savings to you (Precision Data and Diskette Connection on BRAND NAME products also fall into this category.)

2. The people who buy "cosmos"... stuff from major manufacturers that usually quality control standards, but is cosmetically blemished and thus can't be packaged and sold under the manufacturer's own name.

3. "Duplicate Quality". Uncertified media, usually below manufacturer's own standards and frequently below ANSI and IBM standards. Sold on an "as-is" basis with the understanding that the manufacturer's name will never be divulged. Usually a about a 20% reject rate... as compared to DISK WORLD's standard of less than 1/1000th of 1% reject rate. Next to garbage, this is the source of most diskettes advertised at a dollar or less.

They may work... and then again they may not. (Frankly, the odds at the Blackjack table in Las Vegas are more in your favor.) 4. Garbage. Stuff that shouldn't be sold at all. But some manufacturers are hurting for cash, so they sell it anyway. (After all, they want to meet their payroll. Look what happens when you don't... you become a Dyan or Verbatim. Lots of history, but not money.) More and more garbage is being dumped into the market as manufacturers become pressed for cash and are motivated into selling anything and everything they can manufacture. (Read the article in FORBES about Verbatim and its "Bonus" brand.)

Like the Taiwanese counterfeiters are moving into the act. Perfect duplicates of the packaging of major manufacturers with one exception...

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Only DISK WORLD!, Inc. offers fully brand-identified, LIFETIME-WARRANTY product for less than a dollar.

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SHIPPING: Wabash Pinnacle Diskettes are sold in multiples of 100 only. Shipping charges are \$3.00 per 100, regardless of type or size.

PAYMENT: VISA, MASTERCARD and PREPNO orders accepted. Corporations rates 3A2 or better and government and quasi-government open accounts are accepted on a NET 15 basis.

C.O.D. orders are subject to a \$5.00 special handling charge. (Sorry for the increase, but too many people have been refusing C.O.D. orders or using bad checks. It's a classic example of a law "bad cop" making life more expensive for everyone else.)

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# Coming Up



## 1985 Printer Roundup

Last year, *PC Magazine* rounded up every last printer on the market that would work with a PC. The grand total was 120 printers. We tested them all for print quality, noise, speed, and overall excellence of design. Finally, after weeks and weeks of printer madness, *PC Magazine*, Volume 3 Number 23, was a look-no-further buyer's guide to printers—the likes of which had never been seen, not before and not since. The issue offered informative reviews as well as accurate print samples and data to guide you, the potential buyer, through the maze of different products. The project was a huge success both for us and for you: the issue sold out as soon as it hit the stands, and we have yet to see the last of the fan mail.

In the 9 months since that first printer project, 70 new or improved printers have hit the PC market (if you're counting, that's nearly 2 per week), and resident printer guru John Dickinson decided it was high time to take a fresh look at the scene.

*PC Magazine's* next issue is the all-new 1985 printer roundup. Our reviewers tested, examined, and went over each of the 70 printers with a fine-tooth comb, so that they could give you the most up-to-date, reliable, and precise guide to PC printers that has ever been published. As in last year's issue, we list the printers in order of price, so that you can match the quality and features you need with a price you can afford. If you combine this issue with last year's, you'll have comprehensive information on a whopping 190 printers available at your fingertips.

Not content with offering reviews of every new printer on the market, *PC Magazine* pulls out all the stops and takes an in-depth look at the hottest machine in print technology: the laser printer. Bill Harts examines the Canon LBP-CX engine that sits at the heart of nearly every laser machine on the market. Kaare Christian talks about laser graphics: why they're better than conventional graphics, and why they're not. Steve Rosenthal wraps it all up with a peek into the trends of print technology; there's a whole new future out there that might not even include lasers.

Also: Japanese business expert Jared Taylor examines Japan's role in the printer market; Alfred Poor reviews print-enhancement software; and Phil Wiswell takes a look at printer sharing.

If you are looking for the best possible way to get text, data, and graphics from your PC onto paper, then look no further. *PC Magazine* has the guide for you.



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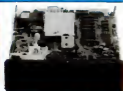
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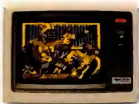
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